



AFF C30 and AFF C60 systems

Install and maintain

NetApp
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AFF C30 and AFF C60 systems

Install and setup

Installation and setup workflow - AFF C30 and AFF C60

To install and set up your AFF C30 or AFF C60 storage system, you must review the installation requirements and considerations, prepare your site, install and cable the hardware components, power on the storage system, and set up the ONTAP cluster.

1

Review the installation requirements and considerations

Before installing your storage system, your storage system must meet the installation requirements and you must review the installation considerations.

2

Prepare for installation

To prepare for install, you need to get the site ready, check the environmental and electrical requirements, and ensure there's enough rack space. Then, unpack the equipment, compare its contents to the packing slip, and register the hardware to access support benefits.

3

Install the hardware

To install the hardware, install the rail kits for your storage system and shelves, and then install and secure your storage system and shelves in the cabinet or telco rack.

4

Cable the hardware

To cable the hardware, connect the controllers to your network and then to your shelves.

5

Power on the storage system

To power on your storage system, power on each shelf and assign a unique shelf ID as needed, and then power on the controllers.

6

Complete storage system setup

To complete the setup of your storage system, access ONTAP System Manager by pointing a browser to the controller's IP address. A setup wizard helps you complete cluster configuration for your storage system.

Installation requirements and considerations - AFF C30 and AFF C60

Review the requirements and considerations for your AFF C30 or AFF C60 storage system.

Equipment needed for install

To install your storage system, you need the following equipment and tools.

- Access to a Web browser to configure your storage system
- Electrostatic discharge (ESD) strap
- Flashlight
- Laptop or console with a USB/serial connection
- Paperclip or narrow tipped ball point pen for setting NS224 storage shelf IDs
- Phillips #2 screwdriver

Lifting precautions

Storage systems and shelves are heavy. Exercise caution when lifting and moving these items.

Storage system weight

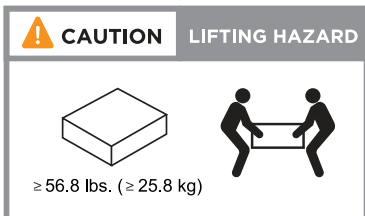
Take the necessary precautions when moving or lifting your storage system.

An A20, A30, or an A50 storage system can weigh up to 61.5 lbs (27.9 kg). To lift the storage system, use two people or a hydraulic lift.

Shelf weight

Take the necessary precautions when moving or lifting your shelf.

An NS224 shelf with NSM100B modules can weigh up to 56.8 lbs (25.8 kg). To lift the shelf, use two people or a hydraulic lift. Keep all components in the shelf (both front and rear) to prevent unbalancing the shelf weight.



Related information

- [Safety information and regulatory notices](#)

What's next?

After you've reviewed the installation requirements and considerations for your storage system, you [prepare for installation](#).

Prepare to install - AFF C30 and AFF C60

Prepare to install your AFF C30 or AFF C60 storage system by getting the site ready, unpacking the boxes and comparing the contents of the boxes to the packing slip, and registering the storage system to access support benefits.

Step 1: Prepare the site

To install your storage system, ensure that the site and the cabinet or rack that you plan to use meet specifications for your configuration.

Steps

1. Use [NetApp Hardware Universe](#) to confirm that your site meets the environmental and electrical requirements for your storage system.
2. Make sure you have adequate cabinet or rack space for your storage system, shelves, and any switches:
 - 2U for a storage system
 - 2U for each NS224 storage shelf
 - 1U for most switches
3. Install any required network switches.

See the [Switch documentation](#) for installation instructions and [NetApp Hardware Universe](#) for compatibility information.

Step 2: Unpack the boxes

After you've ensured that the site and the cabinet or rack that you plan to use for your storage system meet the required specifications, unpack all boxes and compare the contents to the items on the packing slip.

Steps

1. Carefully open all the boxes and lay out the contents in an organized manner.
2. Compare the contents you've unpacked with the list on the packing slip.



You can get your packing list by scanning the QR code on the side of the shipping carton.

The following items are some of the contents you might see in the boxes.

Ensure that everything in the boxes matches the list on the packing slip. If there are any discrepancies, note them down for further action.

Hardware

- Bezel
- Storage system
- Rail kits with instructions (optional)
- Storage shelf (if you ordered additional storage)

Cables

- Management Ethernet cables (RJ-45 cables)
- Network cables
- Power cords
- Storage cables (if you ordered additional storage)
- USB-C serial console cable

Step 3: Register your storage system

After you've ensured that your site meets the requirements for your storage system specifications, and you've verified that you have all the parts you ordered, you should register your storage system.

Steps

1. Locate the System Serial Numbers (SSN) for every controller being installed. You can find the serial numbers in the following locations:
2. You can find the serial numbers in the following locations:
 - On the packing slip
 - In your confirmation email
 - On each controller



3. Go to the [NetApp Support Site](#).
4. Determine whether you need to register your storage system:

If you are a...	Follow these steps...
Existing NetApp customer	<ol style="list-style-type: none">a. Sign in with your username and password.b. Select Systems > My Systems.c. Confirm that the new serial numbers are listed.d. If it is not, follow the instructions for new NetApp customers.
New NetApp customer	<ol style="list-style-type: none">a. Click Register Now, and create an account.b. Select Systems > Register Systems.c. Enter the storage system's serial numbers and requested details. <p>After your registration is approved, you can download any required software. The approval process might take up to 24 hours.</p>

What's next?

After you've prepared to install your storage system, you [install the hardware for your storage system](#).

Install the hardware - AFF C30 and AFF C60

After you prepare to install your AFF C30 or AFF C60 storage system, install the hardware for the storage system. First, install the rail kits. Then install and secure your storage system in a cabinet or telco rack.

Skip this step if your storage system came in a cabinet.

Before you begin

- Make sure you have the instructions packaged with the rail kit.
- Be aware of the safety concerns associated with the weight of the storage system and shelf.
- Understand that the airflow through the storage system enters from the front where the bezel or end caps are installed and exhausts out the rear where the ports are located.

Steps

1. Install the rail kits for your storage system and shelves as needed, using the instructions included with the kits.
2. Install and secure your storage system in the cabinet or telco rack:
 - a. Position the storage system onto the rails in the middle of the cabinet or telco rack, and then support the storage system from the bottom and slide it into place.
 - b. Secure the storage system to the cabinet or telco rack using the included mounting screws.
3. Attach the bezel to the front of the storage system.
4. Install and secure the shelf as needed.
 - a. Position the back of the shelf onto the rails, and then support the shelf from the bottom and slide it into the cabinet or telco rack.

If you are installing multiple shelves, place the first shelf directly above the controllers. Place the second shelf directly under the controllers. Repeat this pattern for any additional shelves.

- b. Secure the shelf to the cabinet or telco rack using the included mounting screws.

What's next?

After you've installed the hardware for your storage system, you [cable the hardware](#).

Cable the hardware - AFF C30 and AFF C60

After you install your AFF C30 or AFF C60 storage system hardware, cable the controllers to the network and shelves.

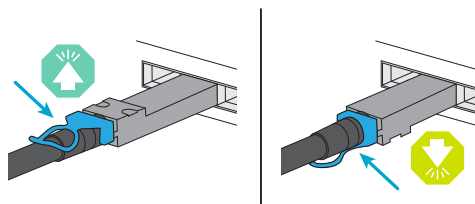
Before you begin

Contact your network administrator for information about connecting the storage system to your network switches.

About this task

- The cluster/HA and host network cabling procedures show common configurations. Keep in mind that the specific cabling depends on the components ordered for your storage system. For comprehensive configuration and slot priority details, see [NetApp Hardware Universe](#).
- The cabling graphics have arrow icons showing the proper orientation (up or down) of the cable connector pull-tab when inserting a connector into a port.

As you insert the connector, you should feel it click into place; if you do not feel it click, remove it, turn it over and try again.



- If cabling to an optical switch, insert the optical transceiver into the controller port before cabling to the switch port.

Step 1: Cable the cluster/HA connections

Cable the controllers to your ONTAP cluster. This procedure differs depending on your storage system model and I/O module configuration.

Switchless cluster cabling

Cable the controllers to each other to create the ONTAP cluster connections.

AFF A30 or A50 with two 2-port 100GbE I/O modules

The I/O module ports in slot 2 and 4 are 40/100GbE ports.???? Does this apply only to 30-50, if yes leave the 2 notes where the are, but if applies to all 3, then move it yo new paragraph below section lead text.????

Steps

1. Cable the Cluster/HA interconnect connections:



The cluster interconnect traffic and the HA traffic share the same physical ports.

- a. Cable controller A port e2a to controller B port e2a.
- b. Cable controller A port e4a to controller B port e4a.

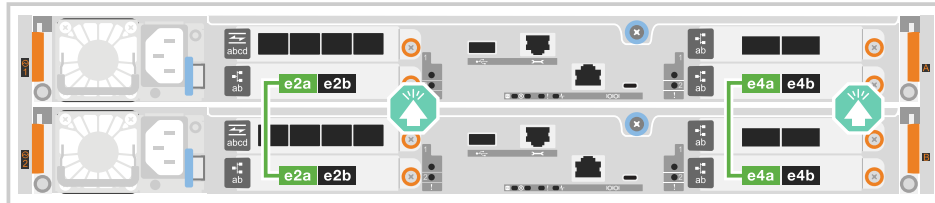


Ports e2b and e4b on the I/O modules in slots 2 and 4 are unused and available for front-end (host network) connectivity, if needed.

Cluster/HA interconnect cables



Controller A



Controller B

AFF A30 or A50 with one 2-port 100GbE I/O module

The I/O module ports in slot 2 and 4 are 40/100GbE ports.????

Steps

1. Cable the Cluster/HA interconnect connections:



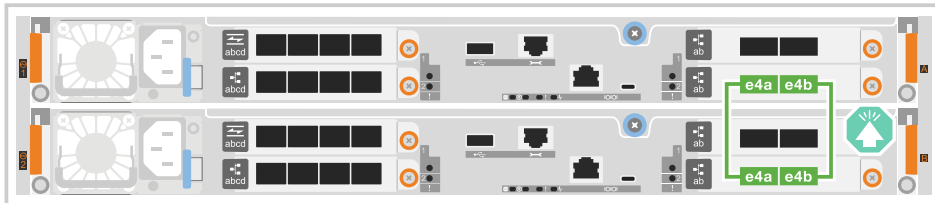
The cluster interconnect traffic and the HA traffic share the same physical ports.

- a. Cable controller A port e4a to controller B port e4a.
- b. Cable controller A port e4b to controller B port e4b.

Cluster/HA interconnect cables



Controller A



Controller B

AFF A20 with one 2-port 10/25GbE I/O module

Add example



+

+

Switched cluster cabling

Cable the controllers to the cluster network switches to create the ONTAP cluster connections.

AFF A30 or A50 with two 2-port 100GbE I/O modules

Add example

Add note: The 40/100GbE ports e2b and e4b on the I/O modules in slots 2 and 4 are unused and available for front-end connectivity, if needed.

AFF A30 or A50 with one 2-port 100GbE I/O module

Steps

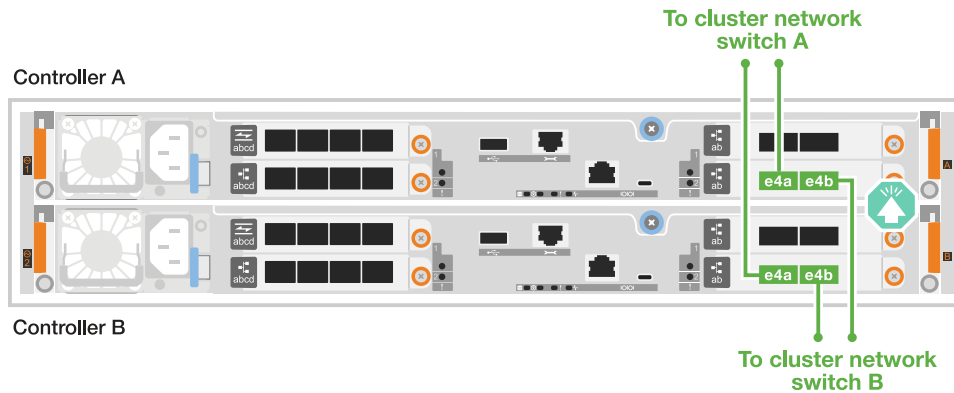
1. Cable the controllers to the cluster network switches:



The cluster interconnect traffic and the HA traffic share the same physical ports.

- a. Cable Controller A port e4a and Controller B port e4a to cluster network switch A.
- b. Cable Controller A port e4b and Controller B port e4b to cluster network switch B.

Cluster/HA interconnect cables



AFF A20 with one 2-port 10/25GbE I/O module

Add example

Step 2: Cable the host network connections

Cable the controllers to your host network. This procedure differs depending on your storage system model and I/O module configuration. Host connectivity is 40/100 GbE.???

AFF A30 or A50 with two 2-port 100GbE I/O modules

Text

AFF A30 or A50 with one 2-port 100GbE I/O module

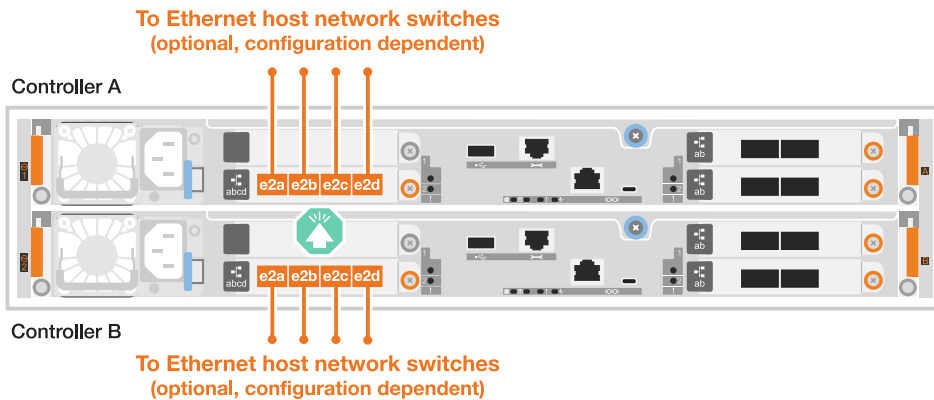
1. Cable the host network connections.

The following substeps are examples of optional host network cabling. If needed, see [NetApp Hardware Universe](#) for your specific storage system configuration.

- a. Optional: Cable to 40/100GbE host network switches.

Cable ports e2a, e2b, e2c and e2d on each controller to the Ethernet host network switches.

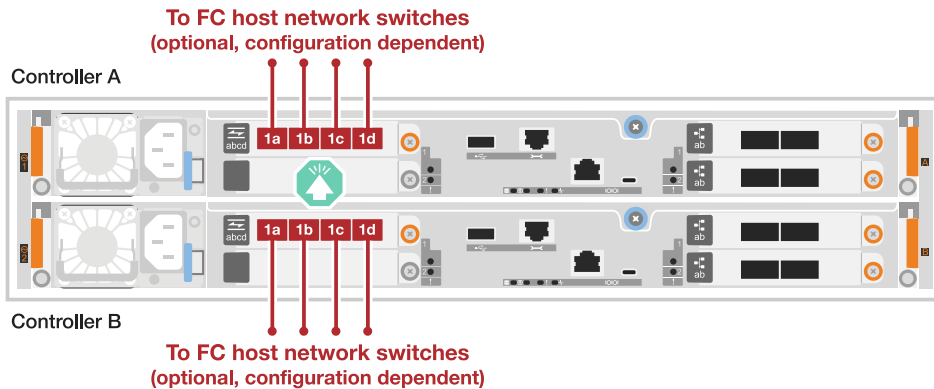
40/100 GbE cables



- b. Optional: Cable to FC host network switches.

Cable ports 1a, 1b, 1c and 1d on each controller to the FC host network switches.

64 Gb/s FC cables



AFF A20 with one 2-port 100GbE module

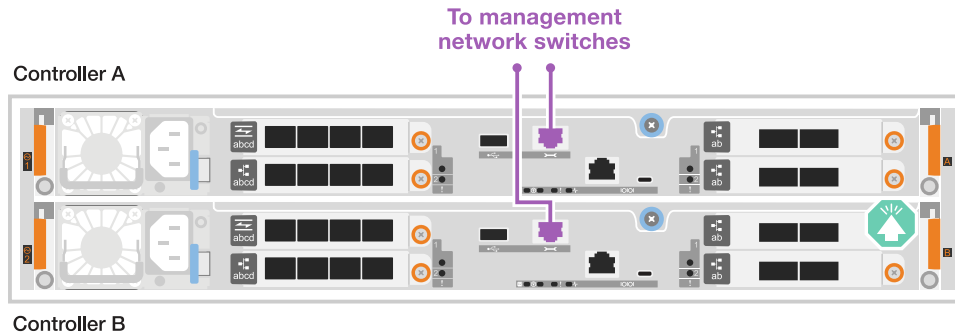
add text

Step 3: Cable the management network connections

Cable the controllers to your management network.

1. Cable the management (wrench) ports on each controller to the management network switches.

1000BASE-T RJ-45 cables



Do not plug in the power cords yet.

Step 4: Cable the shelf connections

This procedure show you how to cable the controllers to one NS224 shelf.

About this task

- For the maximum number of shelves supported for your storage system and for all of your cabling options, such as optical and switch-attached, see [NetApp Hardware Universe](#).
- You cable each controller to each NSM100B module on the NS224 shelf using the storage cables that came with your storage system, which could be the following cable type:

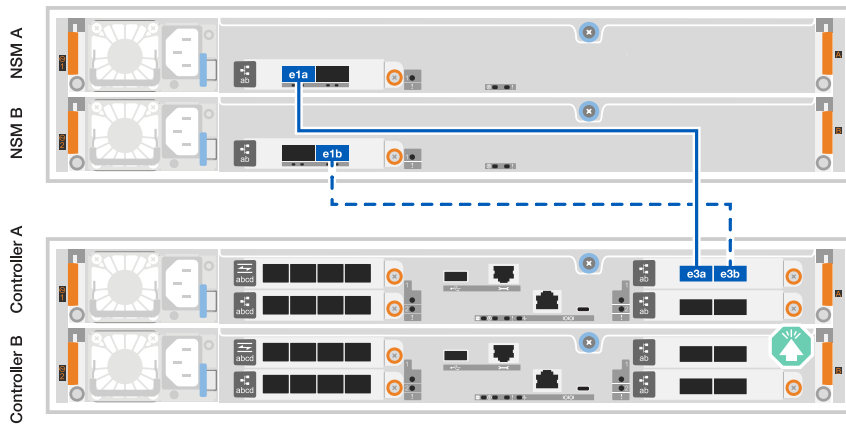
100 GbE QSFP28 copper cables



- The graphics show controller A cabling in blue and controller B cabling in yellow.

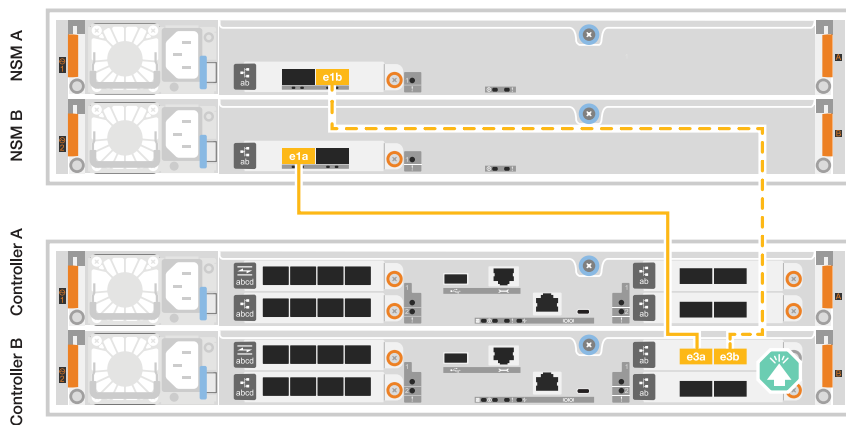
Steps

1. Cable controller A to the shelf:
 - a. Cable controller A port e3a to NSM A port e1a.
 - b. Cable controller A port e3b to NSM B port e1b.



2. Cable controller B to the shelf:

- a. Cable controller B port e3a to NSM B port e1a.
- b. Cable controller B port e3b to NSM A port e1b.



What's next?

After you've cabled the hardware for your storage system, you [power on the storage system](#).

Power on the storage system - AFF C30 and AFF C60

After you cable the controllers to the network and shelves in your AFF C30 or AFF C60 storage system, you power on your shelves and controllers.

Step 1: Power on the shelf and assign shelf ID

Each shelf is distinguished by a unique shelf ID. This ID ensures that the shelf is distinct within your storage system setup.

About this task

- A valid shelf ID is 01 through 99.

If you have internal shelves (storage), which are integrated within the controllers, they are assigned a fixed shelf ID of 00.

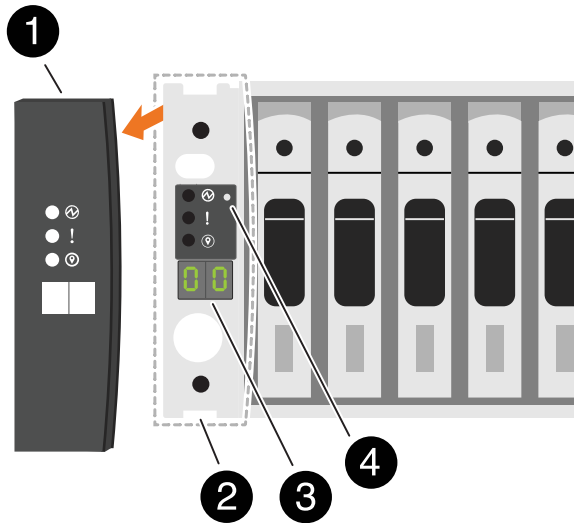
- You must power cycle a shelf (unplug both power cords, wait the appropriate amount of time, and then plug them back in) for the shelf ID to take effect.

Steps

1. Power on the shelf by connecting the power cords first to the shelf, securing them in place with the power cord retainer, and then connecting the power cords to power sources on different circuits.

The shelf powers on and boots automatically when plugged into the power source.

2. Remove the left end cap to access the shelf ID button behind the faceplate.



1	Shelf end cap
2	Shelf faceplate
3	Shelf ID number
4	Shelf ID button

3. Change the first number of the shelf ID:
 - a. Insert the straightened end of a paperclip or narrow tipped ball point pen into the small hole to press the shelf ID button.
 - b. Press and hold the shelf ID button until the first number on the digital display blinks, and then release the button.

It can take up to 15 seconds for the number to blink. This activates the shelf ID programming mode.



If the ID takes longer than 15 seconds to blink, press and hold the shelf ID button again, making sure to press it in all the way.

- c. Press and release the shelf ID button to advance the number until you reach the desired number from 0 to 9.

Each press and release duration can be as short as one second.

The first number continues to blink.

4. Change the second number of the shelf ID:

- a. Press and hold the button until the second number on the digital display blinks.

It can take up to three seconds for the number to blink.

The first number on the digital display stops blinking.

- b. Press and release the shelf ID button to advance the number until you reach the desired number from 0 to 9.

The second number continues to blink.

5. Lock in the desired number and exit the programming mode by pressing and holding the shelf ID button until the second number stops blinking.

It can take up to three seconds for the number to stop blinking.

Both numbers on the digital display start blinking and the amber LED illuminates after about five seconds, alerting you that the pending shelf ID has not yet taken effect.

6. Power-cycle the shelf for at least 10 seconds to make the shelf ID take effect.

- a. Unplug the power cord from both power supplies on the shelf.
- b. Wait 10 seconds.
- c. Plug the power cords back into the shelf power supplies to complete the power cycle.

A power supply is powered on as soon as the power cord is plugged in. Its bicolored LED should illuminate green.

7. Replace the left end cap.

Step 2: Power on the controllers

After you've powered on your shelves and assigned them unique IDs, power on the storage controllers.

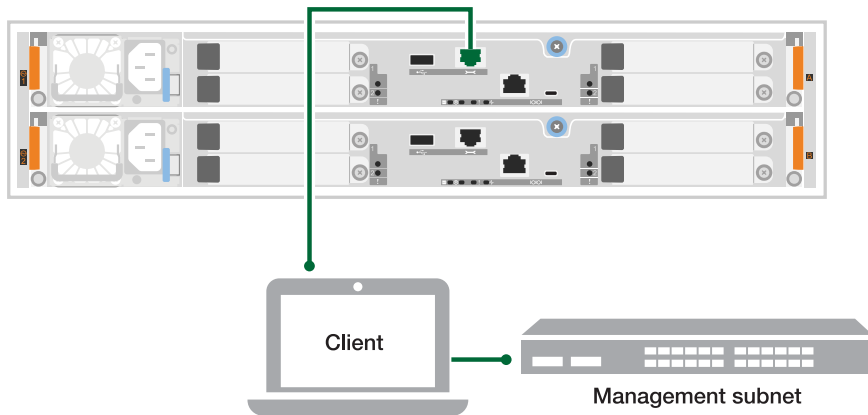
Steps

1. Connect your laptop to the serial console port. This will allow you to monitor the boot sequence when the controllers are powered on.
 - a. Set the serial console port on the laptop to 115,200 baud with N-8-1.

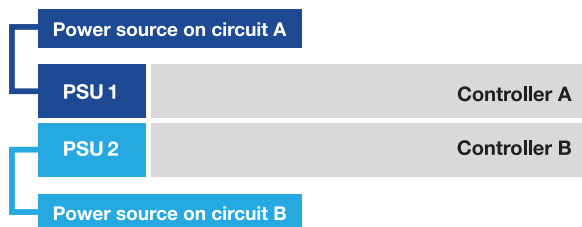


See your laptop's online help for instructions on how to configure the serial console port.

- b. Using the console cable provided with your storage system, connect one end of the console cable to your laptop and the other end to the serial console port on controller A.
- c. Connect the laptop to the switch on the management subnet.



2. Assign a TCP/IP address to the laptop, using one that is on the management subnet.
3. Plug the power cords into the controller power supplies, and then connect them to power sources on different circuits.



- The system begins to boot. Initial booting may take up to eight minutes.
 - The LEDs flash on and the fans start, which indicates that the controllers are powering on.
 - The fans might be very noisy when they first start up. The fan noise during start-up is normal.
4. Secure the power cords using the securing device on each power supply.

What's next?

After you've powered on your storage system, you [complete system setup](#).

Complete storage system setup and configuration - AFF C30 and AFF C60

After you've turned on your storage system, you are ready to discover your cluster network and set up an ONTAP cluster.

Step 1: Gather cluster information

If you have not already done so, gather the information you will need to configure your cluster, such as your cluster management interface port and IP address.

Use the [cluster setup worksheet](#) to record the values that you need during the cluster setup process. If a default value is provided, you can use that value or else enter your own.

Step 2: Discover your cluster network

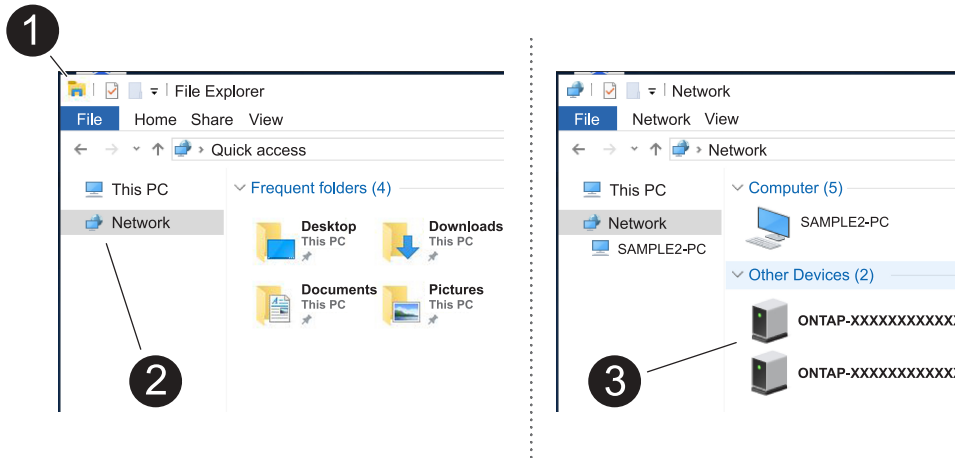
The discovery process enables you to discover your storage system controllers on the network.

Option 1: Network discovery is enabled

If you have network discovery enabled on your laptop, you can complete setup and configuration using automatic cluster discovery.

Steps

1. Connect your laptop to the management switch and access the network computers and devices.
2. Select an ONTAP icon listed to discover:



- a. Open File Explorer.
- b. Click **Network** in the left pane and right-click and select **refresh**.
- c. Double-click either ONTAP icon and accept any certificates displayed on your screen.



XXXXX is the storage system serial number for the target node.

System Manager opens.

Option 2: Network discovery is not enabled

If network discovery is not enabled on your laptop, complete the configuration and setup using the ONTAP command line interface (CLI) Cluster Setup wizard.


Before you begin

Make sure your laptop is connected to the serial console port and the controllers are powered on. See [power on the storage system](#) for instructions.

Steps

Assign an initial node management IP address to one of the nodes.

If the management network has DHCP...	Then...
Configured	Record the IP address assigned to the new controllers.

If the management network has DHCP...	Then...
Not configured	<p>a. Open a console session using PuTTY, a terminal server, or the equivalent for your environment.</p> <div style="display: flex; align-items: center; margin: 10px 0;">  <p>Check your laptop or console's online help if you do not know how to configure PuTTY.</p> </div> <p>b. Connect to the console of the first node.</p> <p>The node boots, and then the Cluster Setup wizard starts on the console.</p> <p>c. Enter the node's management IP address when prompted by the Cluster Setup wizard.</p>

Step 3: Configure your cluster

NetApp recommends that you use System Manager to set up new clusters. See [Configure ONTAP on a new cluster with System Manager](#) for setup instructions.

System Manager provides a simple and easy workflow for cluster set up and configuration including assigning a node management IP address, initializing the cluster, creating a local tier, configuring protocols and initial provisioning of attached storage.

What's next?

After your cluster is initialized, download and run [Active IQ Config Advisor](#) to confirm your setup.

Maintain

Overview of hardware maintenance - AFF C30 and AFF C60

You might need to perform maintenance procedures on your hardware. Procedures specific to maintaining your AFF C30 and AFF C60 system components are in this section.

The procedures in this section assume that the AFF C30 or AFF C60 storage systems have already been deployed as storage nodes in the ONTAP environment.

System components

For the AFF C30 and AFF C60 storage systems, you can perform maintenance procedures on the following components.

Boot media

The boot media stores a primary and secondary set of ONTAP image files as well as system configuration information that the system uses when it boots.

Chassis	The chassis is the physical enclosure housing all the controller components such as the controller/CPU unit, power supply, and I/O.
Controller	A controller consists of a board, firmware, and software. It controls the drives and runs the ONTAP operating system software.
DIMM	A dual in-line memory module (DIMM) is a type of computer memory. They are installed to add system memory to a controller motherboard.
Drive	A drive is a device that provides the physical storage needed for data.
Fan	A fan cools the controller and drives.
I/O module	The I/O module (Input/Output module) is a hardware component that acts as an intermediary between the controller and various devices or systems that need to exchange data with the controller.
NV battery	The non-volatile memory (NV) battery is responsible for providing power to the NVMEM components while data in-flight is being destaged to flash memory after a power loss.
Power supply	A power supply provides a redundant power source in a controller.
Real-time clock battery	A real-time clock battery preserves system date and time information if the power is off.

Boot media

Boot media replacement workflow - AFF C30 and AFF C60

Follow these workflow steps to replace your boot media.

1

Review the boot media requirements

To replace the boot media, you must meet certain requirements.

2

Check onboard encryption keys

Verify whether your storage system has security key manager enabled or encrypted disks.

3

Shut down the impaired controller

Shut down or take over the impaired controller so that the healthy controller continues to serve data from the impaired controller storage.

4

Replace the boot media

Remove the failed boot media from the impaired controller and install the replacement boot media, and then transfer an ONTAP image using a USB flash drive to the replacement boot media.

5

Boot the recovery image

Boot the ONTAP image from the USB drive, restore the file system, and verify the environmental variables.

6

Restore encryption

Restore the onboard key manager configuration or the external key manager from the ONATP boot menu.

7

Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Requirements and considerations - AFF C30 and AFF C60

Before replacing the boot media, make sure to review the following requirements and considerations.

Requirements

- You must have a USB flash drive, formatted to FAT32, with the appropriate amount of storage to hold the `image_XXX.tgz`.
- You must copy the `image_XXX.tgz` file to the USB flash drive for later use in this procedure.
- You must replace the failed component with a replacement FRU component of the same capacity that you received from your provider.

Considerations

- It is important that you apply the commands in these steps on the correct controller:
 - The *impaired* controller is the controller on which you are performing maintenance.
 - The *healthy* controller is the HA partner of the impaired controller.
- If needed, you can turn on the platform chassis location (blue) LEDs to aid in physically locating the affected platform. Log into the BMC using SSH and enter the `system location-led on` command.

A platform chassis has three location LEDs: one on the operator display panel and one on each controller. Location LEDs remain illuminated for 30 minutes.

You can turn them off by entering the `system location-led off` command. If you are unsure if the LEDs are on or off, you can check their state by entering the `system location-led show` command.

Check onboard encryption keys - AFF C30 and AFF C60

Before shutting down the impaired controller, check if your version of ONTAP supports

NetApp Volume Encryption (NVE) and if your key management system is properly configured.

Step 1: Check if your version of ONTAP supports NetApp Volume Encryption

Check whether your ONTAP version supports NetApp Volume Encryption (NVE). This information is crucial for downloading the correct ONTAP image.

1. Determine if your ONTAP version supports encryption by running the following command:

```
version -v
```

If the output includes `1Ono-DARE`, NVE is not supported on your cluster version.

2. Depending on whether NVE is supported on your system, take one of the following actions:
 - If NVE is supported, download the ONTAP image with NetApp Volume Encryption.
 - If NVE is not supported, download the ONTAP image **without** NetApp Volume Encryption.

Step 2: Determine if it is safe to shut down the controller

To safely shut down a controller, first identify whether the External Key Manager (EKM) or the Onboard Key Manager (OKM) is active. Then, verify the key manager in use, display the appropriate key information, and take action based on the status of the authentication keys.

1. Determine which key manager is enabled on your system:

ONTAP version	Run this command
ONTAP 9.14.1 or later	<pre>security key-manager keystore show</pre> <ul style="list-style-type: none">• If EKM is enabled, <code>EKM</code> is listed in the command output.• If OKM is enabled, <code>OKM</code> is listed in the command output.• If no key manager is enabled, <code>No key manager keystores configured</code> is listed in the command output.
ONTAP 9.13.1 or earlier	<pre>security key-manager show-key-store</pre> <ul style="list-style-type: none">• If EKM is enabled, <code>external</code> is listed in the command output.• If OKM is enabled, <code>onboard</code> is listed in the command output.• If no key manager is enabled, <code>No key managers configured</code> is listed in the command output.

2. Depending on whether a key manager is configured on your system, select one of the following options.

No key manager configured

You can safely shut down the impaired controller. Go to [shutdown the impaired controller](#).

External or Onboard key manager configured

- a. Enter the following query command to display the status of the authentication keys in your key manager.

```
security key-manager key query
```

- b. Check the output for the value in the `Restored` column for your key manager.

This column indicates whether the authentication keys for your key manager (either EKM or OKM) have been successfully restored.

3. Depending on whether your system is using the External Key Manager or Onboard Key Manager, select one of the following options.

External Key Manager

Depending on the output value displayed in the `Restored` column, follow the appropriate steps.

Output value in <code>Restored</code> column	Follow these steps...
<code>true</code>	You can safely shut down the impaired controller. Go to shutdown the impaired controller .
Anything other than <code>true</code>	<ol style="list-style-type: none">Restore the external key management authentication keys to all nodes in the cluster using the following command: <pre>security key-manager external restore</pre><p>If the command fails, contact NetApp Support.</p>Verify that the <code>Restored</code> column displays <code>true</code> for all authentication keys by entering the <code>security key-manager key query</code> command. If all the authentication keys are <code>true</code>, you can safely shut down the impaired controller. Go to shutdown the impaired controller.

Onboard Key Manager

Depending on the output value displayed in the `Restored` column, follow the appropriate steps.

Output value in <code>Restored</code> column	Follow these steps...
<code>true</code>	<p>Manually back up the OKM information.</p> <ol style="list-style-type: none">Go to the advanced mode by entering <code>set -priv advanced</code> and then enter <code>Y</code> when prompted.Enter the following command to display the key management information: <pre>security key-manager onboard show-backup</pre>Copy the contents of the backup information to a separate file or your log file. You'll need it in disaster scenarios where you might need to manually recover OKM.You can safely shut down the impaired controller. Go to shutdown the impaired controller.

Output value in Restored column	Follow these steps...
Anything other than <code>true</code>	<p>a. Enter the onboard security key-manager sync command:</p> <pre>security key-manager onboard sync</pre> <p>b. Enter the 32 character, alphanumeric onboard key management passphrase when prompted.</p> <p>If the passphrase cannot be provided, contact NetApp Support.</p> <p>c. Verify the Restored column displays <code>true</code> for all authentication keys:</p> <pre>security key-manager key query</pre> <p>d. Verify that the Key Manager type displays <code>onboard</code>, and then manually back up the OKM information.</p> <p>e. Enter the command to display the key management backup information:</p> <pre>security key-manager onboard show-backup</pre> <p>f. Copy the contents of the backup information to a separate file or your log file.</p> <p>You'll need it in disaster scenarios where you might need to manually recover OKM.</p> <p>g. You can safely shut down the impaired controller. Go to shutdown the impaired controller.</p>

Shut down impaired controller - AFF C30 and AFF C60

Shut down or take over the impaired controller.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, [quorum status](#) of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a

healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode impaired_node_name</code> When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i> .

Replace the boot media - AFF C30 and AFF C60

To replace the boot media, you must remove the impaired controller, remove the boot media, install the replacement boot media, and transfer the boot image to a USB flash drive.

Step 1: Remove the controller

You must remove the controller from the chassis when you replace the controller or replace a component inside the controller.

Before you begin

All other components in the storage system must be functioning properly; if not, you must contact [NetApp Support](#) before continuing with this procedure.

Steps

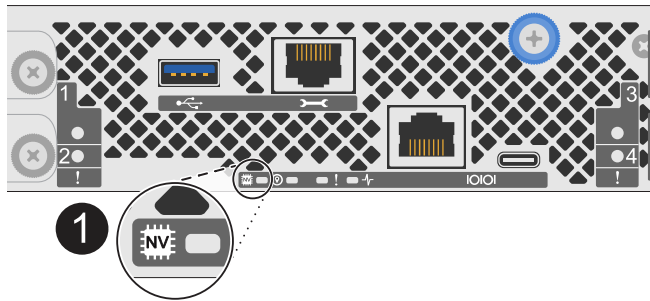
1. On the impaired controller, make sure the NV LED is off.

When the NV LED is off, destaging is complete and it is safe to remove the impaired controller.



If the NV LED is flashing (green), destage is in progress. You must wait for the NV LED to turn off. However, if the flashing continues for longer than five minutes, contact [NetApp Support](#) before continuing with this procedure.

The NV LED is located next to the NV icon on the controller.



1

NV icon and LED on the controller

2. If you are not already grounded, properly ground yourself.
3. Disconnect the power on the impaired controller:



Power supplies (PSUs) do not have a power switch.

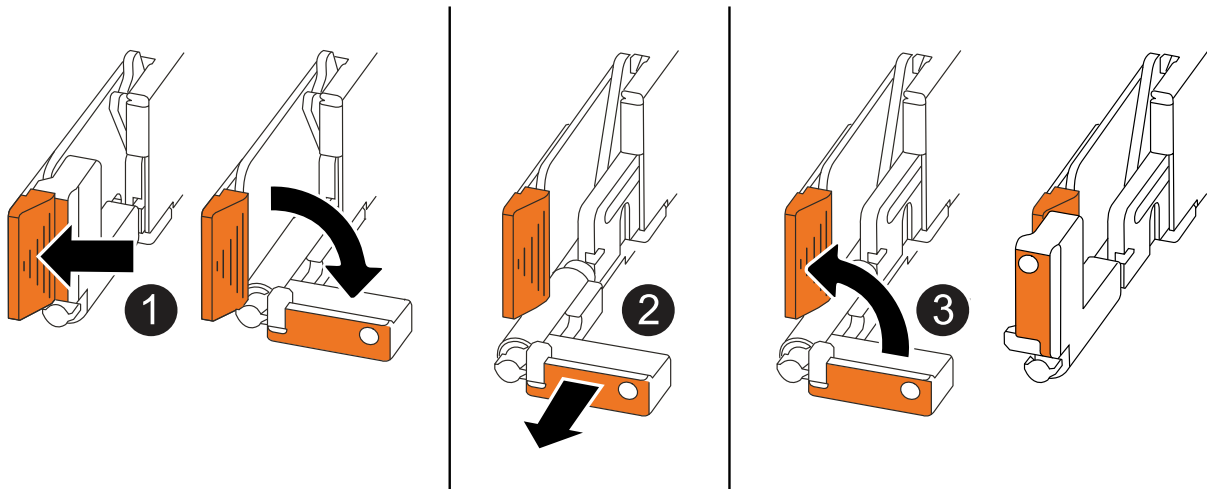
If you are disconnecting a...	Then...
AC PSU	<ol style="list-style-type: none"> 1. Open the power cord retainer. 2. Unplug the power cord from the PSU and set it aside.
DC PSU	<ol style="list-style-type: none"> 1. Unscrew the two thumb screws on the D-SUB DC power cord connector. 2. Unplug the power cord from the PSU and set it aside.

4. Unplug all cables from the impaired controller.

Keep track of where the cables were connected.

5. Remove the impaired controller:

The following illustration shows the operation of the controller handles (from the left side of the controller) when removing a controller:



<p>1</p>	<p>On both ends of the controller, push the vertical locking tabs outward to release the handles.</p>
<p>2</p>	<ul style="list-style-type: none"> • Pull the handles towards you to unseat the controller from the midplane. <p>As you pull, the handles extend out from the controller and then you feel some resistance, keep pulling.</p> <ul style="list-style-type: none"> • Slide the controller out of the chassis while supporting the bottom of the controller, and place it on a flat, stable surface.
<p>3</p>	<p>If needed, rotate the handles upright (next to the tabs) to move them out of the way.</p>

6. Place the controller on an anti-static mat.

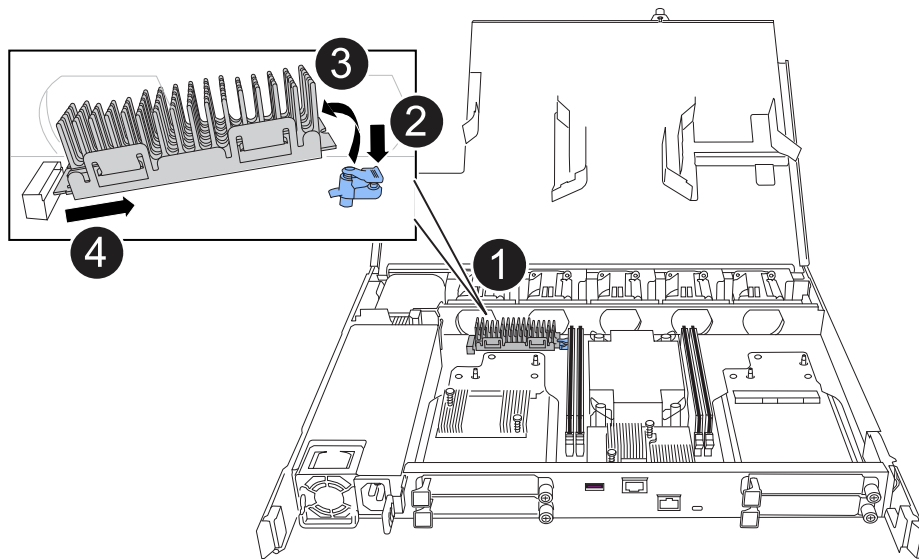
7. Open the controller cover by turning the thumbscrew counterclockwise to loosen, and then open the cover.

Step 2: Replace the boot media

To replace the boot media, locate it inside the controller and follow the specific sequence of steps.

1. If you are not already grounded, properly ground yourself.

2. Remove the boot media:



1	Boot media location
2	Press down on the blue tab to release the right end of the boot media.
3	Lift the right end of the boot media up at a slight angle to get a good grip along the sides of the boot media.
4	Gently pull the left end of the boot media out of its socket.

3. Install the replacement boot media:

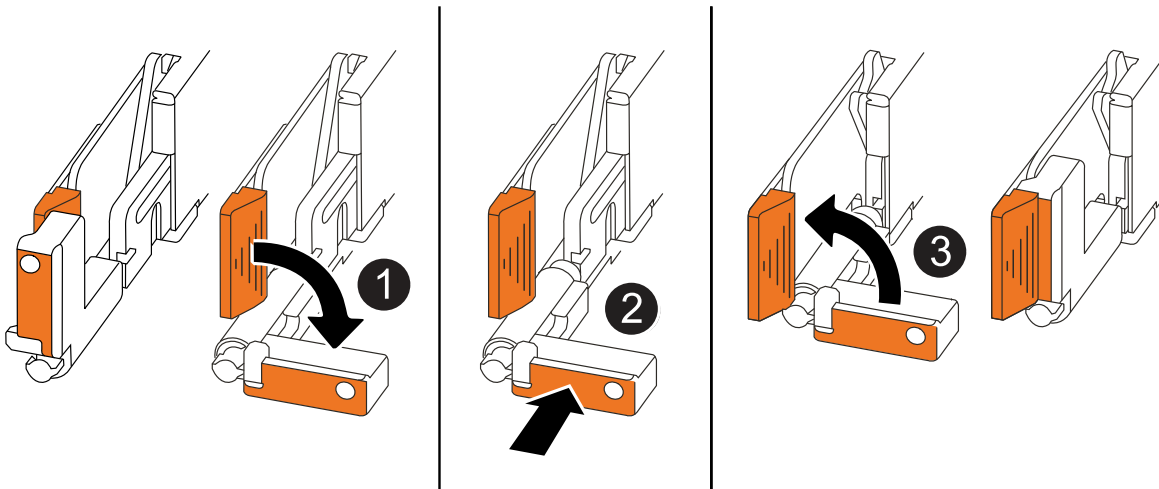
- a. Remove the boot media from its package.
- b. Slide the socket end of the boot media into its socket.
- c. At the opposite end of the boot media, press down and hold the blue tab (in the open position), gently push down on that end of the boot media until it stops, and then release the tab to lock the boot media into place.

Step 3: Reinstall the controller

Reinstall the controller into the chassis, but do not reboot it.

About this task

The following illustration shows the operation of the controller handles (from the left side of a controller) when reinstalling the controller, and can be used as a reference for the rest of the controller reinstallation steps.



1	If you rotated the controller handles upright (next to the tabs) to move them out of the way while you serviced the controller, rotate them down to the horizontal position.
2	Push the handles to reinsert the controller into the chassis halfway and then, when instructed, push until the controller is fully seated.
3	Rotate the handles to the upright position and lock in place with the locking tabs.

Steps

1. Close the controller cover and turn the thumbscrew clockwise until tightened.
2. Insert the controller halfway into the chassis.

Align the rear of the controller with the opening in the chassis, and then gently push the controller using the handles.



Do not completely insert the controller in the chassis until instructed to do so later in this procedure.

3. Reconnect the cables to the controller; however, do not plug in the power cord to the power supply (PSU) at this time.



Make sure that the console cable is connected to the controller because you want to catch and log the boot sequence later in the boot media replacement procedure when you fully seat the controller in the chassis and it begins to boot.

Step 4: Transfer the boot image to the boot media

The replacement boot media that you installed is without an ONTAP image so you need to transfer an ONTAP image using a USB flash drive.

Before you begin

- You must have a USB flash drive, formatted to FAT32, with at least 4GB capacity.
- You must have a copy of the same image version of ONTAP as what the impaired controller was running. You can download the appropriate image from the [Downloads](#) section on the NetApp Support Site

- If NVE is supported, download the image with NetApp Volume Encryption, as indicated in the download button.
- If NVE is not supported, download the image without NetApp Volume Encryption, as indicated in the download button.
- You must have a network connection between the node management ports of the controllers (typically the e0M interfaces).

Steps

1. Download and copy the appropriate service image from the [NetApp Support Site](#) to the USB flash drive.
 - a. Download the service image from the Downloads link on the page, to your work space on your laptop.
 - b. Unzip the service image.



If you are extracting the contents using Windows, do not use WinZip to extract the netboot image. Use another extraction tool, such as 7-Zip or WinRAR.

The USB flash drive should have the appropriate ONTAP image of what the impaired controller is running.

- c. Remove the USB flash drive from your laptop.
2. Insert the USB flash drive into the USB-A port on the impaired controller.

Make sure that you install the USB flash drive in the slot labeled for USB devices, and not in the USB console port.

3. Fully seat the impaired controller in the chassis:
 - a. Firmly push on the handles until the controller meets the midplane and is fully seated.



Do not use excessive force when sliding the controller into the chassis; it could damage the connectors.



The controller boots when fully seated in the chassis. It gets its power from the partner controller.

- b. Rotate the controller handles up and lock in place with the tabs.
4. Interrupt the boot process by pressing Ctrl-C to stop at the LOADER prompt.

If you miss this message, press Ctrl-C, select the option to boot to Maintenance mode, and then halt the controller to boot to LOADER.

5. Set your network connection type at the LOADER prompt:
 - If you are configuring DHCP:

```
ifconfig e0M -auto
```



The target port you configure is the target port you use to communicate with the impaired controller from the healthy controller during var file system restore with a network connection. You can also use the e0M port in this command.

- If you are configuring manual connections:

```
ifconfig e0M -addr=filer_addr -mask=netmask -gw=gateway
```

- `filer_addr` is the IP address of the storage system.
- `netmask` is the network mask of the management network that is connected to the HA partner.
- `gateway` is the gateway for the network.



Other parameters might be necessary for your interface. You can enter `help ifconfig` at the firmware prompt for details.

6. Reconnect the power cord to the power supply (PSU) on the impaired controller.

Once power is restored to the PSU, the status LED should be green.

If you are reconnecting a...	Then...
AC PSU	<ol style="list-style-type: none"> 1. Plug the power cord into the PSU. 2. Secure the power cord with the power cord retainer.
DC PSU	<ol style="list-style-type: none"> 1. Plug the D-SUB DC power cord connector into the PSU. 2. Tighten the two thumb screws to secure the D-SUB DC power cord connector to the PSU.

Boot the recovery image - AFF C30 and AFF C60

You must boot the ONTAP image from the USB drive, restore the file system, and verify the environmental variables.

Steps

1. From the LOADER prompt, boot the recovery image from the USB flash drive: `boot_recovery`

The image is downloaded from the USB flash drive.

2. When prompted, either enter the name of the image or accept the default image displayed inside the brackets on your screen.
3. Restore the var file system:

Option 1: ONTAP 9.16.0 or earlier

- a. On the impaired controller, press `Y` when you see `Do you want to restore the backup configuration now?`
- b. On the impaired controller, press `Y` when prompted to overwrite `/etc/ssh/ssh_host_ecdsa_key`.
- c. On the healthy partner controller, set the impaired controller to advanced privilege level: `set -privilege advanced`.
- d. On the healthy partner controller, run the restore backup command: `system node restore-backup -node local -target-address impaired_node_IP_address`.

NOTE: If you see any message other than a successful restore, contact [NetApp Support](#).

- e. On the healthy partner controller, return the impaired controller to admin level: `set -privilege admin`.
- f. On the impaired controller, press `Y` when you see `Was the restore backup procedure successful?`.
- g. On the impaired controller, press `Y` when you see `...would you like to use this restored copy now?`.
- h. On the impaired controller, press `Y` when prompted to reboot the impaired controller and press `ctrl-c` for the Boot Menu.
- i. If the system does not use encryption, select *Option 1 Normal Boot.*, otherwise go to [Restore encryption](#).

Option 2: ONTAP 9.16.1 or later

- a. On the impaired controller, press `Y` when prompted to restore the backup configuration.

After restore procedure is successful, this message will be seen on the console - `syncflash_partner: Restore from partner complete`.

- b. On the impaired controller, press `Y` when prompted to confirm if the restore backup was successful.
- c. On the impaired controller, press `Y` when prompted to use the restored configuration.
- d. On the impaired controller, press `Y` when prompted to reboot the node.
- e. On the impaired controller, press `Y` when prompted to reboot the impaired controller and press `ctrl-c` for the Boot Menu.
- f. If the system does not use encryption, select *Option 1 Normal Boot.*, otherwise go to [Restore encryption](#).

4. Connect the console cable to the partner controller.
5. Give back the controller using the `storage failover giveback -fromnode local` command.
6. Restore automatic giveback if you disabled it by using the `storage failover modify -node local -auto-giveback true` command.
7. If AutoSupport is enabled, restore/unsuppress automatic case creation by using the `system node autosupport invoke -node * -type all -message MAINT=END` command.

NOTE: If the process fails, contact [NetApp Support](#).

Restore encryption - AFF C30 and AFF C60

Restore encryption on the replacement boot media.

You must complete steps specific to systems that have Onboard Key Manager (OKM), NetApp Storage Encryption (NSE) or NetApp Volume Encryption (NVE) enabled using the settings that you captured at the beginning of the boot media replace procedure.

Depending on which a key manger is configured on your system, select one of the following options to restore it from the boot menu.

- [Option 1: Restore the Onboard Key Manager configuration](#)
- [Option 2: Restore the External Key Manager configuration](#)

Option 1: Restore the Onboard Key Manager configuration

Restore the Onboard Key Manager (OKM) configuration from the ONTAP boot menu.

Before you begin

- Make sure you have following information while restoring the OKM configuration:
 - Cluster-wide passphrase entered [while enabling onboard key management](#).
 - [Backup information for the Onboard Key Manager](#).
- Perform the [How to verify onboard key management backup and cluster-wide passphrase](#) procedure before proceeding.

Steps

1. Connect the console cable to the target controller.
2. From the ONTAP boot menu select the appropriate option from the boot menu.

ONTAP version	Select this option
ONTAP 9.8 or later	<p data-bbox="621 153 833 191">Select option 10.</p> <p data-bbox="621 222 951 260">Show example boot menu</p> <div data-bbox="654 296 1455 1079" style="border: 1px solid #ccc; padding: 10px;"><p data-bbox="683 331 1295 369">Please choose one of the following:</p><ul data-bbox="683 411 1370 1010" style="list-style-type: none"><li data-bbox="683 411 980 449">(1) Normal Boot.<li data-bbox="683 453 1138 491">(2) Boot without /etc/rc.<li data-bbox="683 495 1049 533">(3) Change password.<li data-bbox="683 537 1370 606">(4) Clean configuration and initialize all disks.<li data-bbox="683 611 1154 648">(5) Maintenance mode boot.<li data-bbox="683 653 1330 690">(6) Update flash from backup config.<li data-bbox="683 695 1243 732">(7) Install new software first.<li data-bbox="683 737 980 774">(8) Reboot node.<li data-bbox="683 779 1192 848">(9) Configure Advanced Drive Partitioning.<li data-bbox="683 852 1333 921">(10) Set Onboard Key Manager recovery secrets.<li data-bbox="683 926 1317 995">(11) Configure node for external key management.<p data-bbox="683 1010 1032 1047">Selection (1-11)? 10</p></div>

ONTAP version	Select this option
ONTAP 9.7 and earlier	<p data-bbox="626 159 1364 193">Select the hidden option <code>recover_onboard_keymanager</code></p> <p data-bbox="626 226 948 260">Show example boot menu</p> <div data-bbox="656 302 1455 966" style="border: 1px solid #ccc; padding: 10px; background-color: #f9f9f9;"> <p data-bbox="682 336 1292 369">Please choose one of the following:</p> <ul style="list-style-type: none"> <li data-bbox="688 415 977 449">(1) Normal Boot. <li data-bbox="688 457 1133 491">(2) Boot without <code>/etc/rc</code>. <li data-bbox="688 499 1049 533">(3) Change password. <li data-bbox="682 541 1367 609">(4) Clean configuration and initialize all disks. <li data-bbox="688 617 1153 651">(5) Maintenance mode boot. <li data-bbox="688 659 1328 693">(6) Update flash from backup config. <li data-bbox="688 701 1240 735">(7) Install new software first. <li data-bbox="688 743 977 777">(8) Reboot node. <li data-bbox="688 785 1192 852">(9) Configure Advanced Drive Partitioning. <p data-bbox="682 861 980 894">Selection (1-19)?</p> <p data-bbox="682 903 1140 936"><code>recover_onboard_keymanager</code></p> </div>

3. Confirm that you want to continue the recovery process.

Show example prompt

```
This option must be used only in disaster recovery procedures. Are you
sure? (y or n):
```

4. Enter the cluster-wide passphrase twice.

While entering the passphrase the console will not show any input.

Show example prompt

```
Enter the passphrase for onboard key management:
Enter the passphrase again to confirm:
```

5. Enter the backup information.

a. Paste the entire content from the BEGIN BACKUP line through the END BACKUP line.

Show example prompt

Enter the backup data:

```
-----BEGIN BACKUP-----  
0123456789012345678901234567890123456789012345678901234567890123  
1234567890123456789012345678901234567890123456789012345678901234  
2345678901234567890123456789012345678901234567890123456789012345  
3456789012345678901234567890123456789012345678901234567890123456  
4567890123456789012345678901234567890123456789012345678901234567  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
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AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
0123456789012345678901234567890123456789012345678901234567890123  
1234567890123456789012345678901234567890123456789012345678901234  
2345678901234567890123456789012345678901234567890123456789012345  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  
-----END BACKUP-----
```

b. Press the enter key twice at the end of the input.

The recovery process completes.

Show example prompt

```
Trying to recover keymanager secrets....
Setting recovery material for the onboard key manager
Recovery secrets set successfully
Trying to delete any existing km_onboard.wkeydb file.

Successfully recovered keymanager secrets.

*****
*****
* Select option "(1) Normal Boot." to complete recovery process.
*
* Run the "security key-manager onboard sync" command to
synchronize the key database after the node reboots.
*****
*****
```



Do not proceed if the displayed output is anything other than `Successfully recovered keymanager secrets`. Perform troubleshooting to correct the error.

6. Select option 1 from the boot menu to continue booting into ONTAP.

Show example prompt

```
*****
*****
* Select option "(1) Normal Boot." to complete the recovery process.
*
*****
*****

(1) Normal Boot.
(2) Boot without /etc/rc.
(3) Change password.
(4) Clean configuration and initialize all disks.
(5) Maintenance mode boot.
(6) Update flash from backup config.
(7) Install new software first.
(8) Reboot node.
(9) Configure Advanced Drive Partitioning.
(10) Set Onboard Key Manager recovery secrets.
(11) Configure node for external key management.
Selection (1-11)? 1
```

7. Confirm that the controller's console displays the following message.

```
Waiting for giveback...(Press Ctrl-C to abort wait)
```

8. From the partner node, giveback the partner controller by entering the following command.

```
storage failover giveback -fromnode local -only-cfo-aggregates true.
```

9. After booting with only the CFO aggregate, run the following command.

```
security key-manager onboard sync
```

10. Enter the cluster-wide passphrase for the Onboard Key Manager.

Show example prompt

```
Enter the cluster-wide passphrase for the Onboard Key Manager:
```

```
All offline encrypted volumes will be brought online and the
corresponding volume encryption keys (VEKs) will be restored
automatically within 10 minutes. If any offline encrypted volumes
are not brought online automatically, they can be brought online
manually using the "volume online -vserver <vserver> -volume
<volume_name>" command.
```



If the sync is successful the cluster prompt is returned with no additional messages. If the sync fails an error message appears before returning to the cluster prompt. Do not continue until the error is corrected and the sync runs successfully.

11. Ensure that all keys are synced by entering the following command.

```
security key-manager key query -restored false.
```

```
There are no entries matching your query.
```



No results should appear when filtering for false in the restored parameter.

12. Giveback the node from the partner by entering the following command.

```
storage failover giveback -fromnode local
```

13. Restore automatic giveback, if you disabled it, by entering the following command.

```
storage failover modify -node local -auto-giveback true
```

14. If AutoSupport is enabled, restore automatic case creation by entering the following command.

```
system node autosupport invoke -node * -type all -message MAINT=END
```

Option 2: Restore the External Key Manager configuration

Restore the External Key Manager configuration from the ONTAP boot menu.

Before you begin

You need the following information for restoring the External Key Manager (EKM) configuration.

- A copy of the `/cfcard/kmip/servers.cfg` file from another cluster node or the following information:
 - The KMIP server address.
 - The KMIP port.
- A copy of the `/cfcard/kmip/certs/client.crt` file from another cluster node or the client certificate.

- A copy of the `/cfcard/kmip/certs/client.key` file from another cluster node or the client key.
- A copy of the `/cfcard/kmip/certs/CA.pem` file from another cluster node or the KMIP server CA(s).

Steps

1. Connect the console cable to the target controller.
2. Select option 11 from the ONTAP boot menu.

Show example boot menu

```
(1) Normal Boot.
(2) Boot without /etc/rc.
(3) Change password.
(4) Clean configuration and initialize all disks.
(5) Maintenance mode boot.
(6) Update flash from backup config.
(7) Install new software first.
(8) Reboot node.
(9) Configure Advanced Drive Partitioning.
(10) Set Onboard Key Manager recovery secrets.
(11) Configure node for external key management.
Selection (1-11)? 11
```

3. When prompted, confirm you have gathered the required information.

Show example prompt

```
Do you have a copy of the /cfcard/kmip/certs/client.crt file? {y/n}
Do you have a copy of the /cfcard/kmip/certs/client.key file? {y/n}
Do you have a copy of the /cfcard/kmip/certs/CA.pem file? {y/n}
Do you have a copy of the /cfcard/kmip/servers.cfg file? {y/n}
```

4. When prompted, enter the client and server information.

Show prompt

```
Enter the client certificate (client.crt) file contents:
Enter the client key (client.key) file contents:
Enter the KMIP server CA(s) (CA.pem) file contents:
Enter the server configuration (servers.cfg) file contents:
```

Show example

```
Enter the client certificate (client.crt) file contents:
-----BEGIN CERTIFICATE-----
MIIDvjCCAqagAwIBAgICN3gwDQYJKoZIhvcNAQELBQAwY8xCzAJBgNVBAYTAlVT
MRMwEQYDVQQIEwpDYWxpZm9ybmlhMQwwCgYDVQQHEwNTVkwxDzANBgNVBAoTBk5l
MSUwQusvzAFs8G3P54GG32iIRvaCFnj2gQpCxcilJ0qB2foiBGx5XVQ/Mtk+rlap
Pk4ECW/wqSOUXDYtJs1+RB+w0+SHx8mzxpzbz3mXF/X/1PC3YOzVNCq5eieek62si
Fp8=
-----END CERTIFICATE-----

Enter the client key (client.key) file contents:
-----BEGIN RSA PRIVATE KEY-----
<key_value>
-----END RSA PRIVATE KEY-----

Enter the KMIP server CA(s) (CA.pem) file contents:
-----BEGIN CERTIFICATE-----
MIIEizCCA3OgAwIBAgIBADANBgkqhkiG9w0BAQsFADCBjzELMAkGA1UEBhMCVVMx
7yaumMQETNrpMfP+nQMd34y4AmseWYGM6qG0z37BRnYU0Wf2qDL61cQ3/jkm7Y94
EQBKG1NY8dVyjphmYZv+
-----END CERTIFICATE-----

Enter the IP address for the KMIP server: 10.10.10.10
Enter the port for the KMIP server [5696]:

System is ready to utilize external key manager(s).
Trying to recover keys from key servers....
kmip_init: configuring ports
Running command '/sbin/ifconfig e0M'
..
..
kmip_init: cmd: ReleaseExtraBSDPort e0M
```

After you enter the client and server information, the recovery process completes.

Show example

```
System is ready to utilize external key manager(s).
Trying to recover keys from key servers....
[Aug 29 21:06:28]: 0x808806100: 0: DEBUG: kmip2::main:
[initOpenssl]:460: Performing initialization of OpenSSL
Successfully recovered keymanager secrets.
```

5. Select option 1 from the boot menu to continue booting into ONTAP.

Show example prompt

```
*****  
*****  
* Select option "(1) Normal Boot." to complete the recovery process.  
*  
*****  
*****  
  
(1) Normal Boot.  
(2) Boot without /etc/rc.  
(3) Change password.  
(4) Clean configuration and initialize all disks.  
(5) Maintenance mode boot.  
(6) Update flash from backup config.  
(7) Install new software first.  
(8) Reboot node.  
(9) Configure Advanced Drive Partitioning.  
(10) Set Onboard Key Manager recovery secrets.  
(11) Configure node for external key management.  
Selection (1-11)? 1
```

6. Restore automatic giveback, if you disabled it, by entering the following command.

```
storage failover modify -node local -auto-giveback true
```

7. If AutoSupport is enabled, restore automatic case creation by entering the following command.

```
system node autosupport invoke -node * -type all -message MAINT=END
```

Return the failed part to NetApp - AFF C30 and AFF C60

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return and Replacements](#) page for further information.

Chassis

Chassis replacement workflow - AFF C30 and AFF C60

Follow these workflow steps to replace your chassis.



[Review the chassis replace requirements](#)

To replace the chassis, you must meet certain requirements.

2

Shut down the controllers

Shut down the controllers so you can perform maintenance on the chassis.

3

Replace the chassis

Replacing the chassis includes moving the power supplies, hard drives, and controller module from the impaired chassis to the new chassis, and swapping out the impaired chassis with the new chassis of the same model as the impaired chassis.

4

Complete chassis replacement

Verify the HA state of the chassis and return the failed part to NetApp.

Requirements and considerations - AFF C30 and AFF C60

Before replacing the chassis, make sure to review the following requirements and considerations.

Requirements

- The replacement chassis must be the same model as the impaired chassis. This procedure is for a like-for-like replacement, not for an upgrade.
- All other components in the storage system must be functioning properly; if not, you must contact [NetApp Support](#) before continuing with this procedure.

Considerations

- **The chassis replacement procedure is disruptive.** For a two-node cluster, you will have a complete service outage and a partial outage in a multi-node cluster.
- You can use the chassis replacement procedure with all versions of ONTAP supported by your storage system.
- The chassis replacement procedure is written with the assumption that you are moving the bezel, drives, any drive blanks, and controllers to the new chassis.
- If needed, you can turn on the storage system location (blue) LEDs to aid in physically locating the affected storage system. Log into the BMC using SSH and enter the `system location-led on` command.

A storage system has three location LEDs: one on the operator display panel and one on each controller. Location LEDs remain illuminated for 30 minutes.

You can turn them off by entering the `system location-led off` command. If you are unsure if the LEDs are on or off, you can check their state by entering the `system location-led show` command.

Shut down the controllers - AFF C30 and AFF C60

Shut down the controllers so you can perform maintenance on the chassis.

This procedure is for systems with two node configurations. If you have a system with more than two nodes, see [How to perform a graceful shutdown and power up of one HA pair in a four node cluster](#).

Before you begin

- Stop all clients/host from accessing data on the NetApp system.
- Suspend external backup jobs.
- Make sure you have the necessary permissions and credentials:
 - Local administrator credentials for ONTAP.
 - NetApp onboard key management (OKM) cluster-wide passphrase if using storage encryption or NVE/NAE.
 - BMC accessibility for each controller.
- Make sure you have the necessary tools and equipment for the replacement.
- As a best practice before shutdown, you should:
 - Perform additional [system health checks](#).
 - Upgrade ONTAP to a recommended release for the system.
 - Resolve any [Active IQ Wellness Alerts and Risks](#). Make note of any faults presently on the system, such as LEDs on the system components.

Steps

1. Log into the cluster through SSH or log in from any node in the cluster using a local console cable and a laptop/console.
2. Turn off AutoSupport and indicate how long you expect the system to be offline:

```
system node autosupport invoke -node * -type all -message "MAINT=8h Power Maintenance"
```

3. Identify the SP/BMC address of all nodes:

```
system service-processor show -node * -fields address
```

4. Exit the cluster shell: `exit`
5. Log into SP/BMC over SSH using the IP address of any of the nodes listed in the output from the previous step.

If you are using a console/laptop, log into the controller using the same cluster administrator credentials.



Open an SSH session to every SP/BMC connection so that you can monitor progress.

6. Halt the two nodes located in the impaired chassis:

```
system node halt -node <node1>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true
```



For clusters using SnapMirror synchronous operating in StrictSync mode: `system node halt -node <node1>,<node2> -skip-lif-migration-before-shutdown true -ignore-quorum-warnings true -inhibit-takeover true -ignore-strict-sync-warnings true`

7. Enter **y** for each controller in the cluster when you see *Warning: Are you sure you want to halt node "cluster <node-name> number"? {y|n}:*
8. Wait for each controller to halt and display the LOADER prompt.

Replace the chassis - AFF C30 and AFF C60

Move the drives, any drive blanks, controllers, and bezel from the impaired chassis to the replacement chassis (of the same model), and then replace the impaired chassis within the equipment rack or system cabinet.

Step 1: Remove the controller

You must remove the controller from the chassis when you replace the controller or replace a component inside the controller.

Before you begin

All other components in the storage system must be functioning properly; if not, you must contact [NetApp Support](#) before continuing with this procedure.

Steps

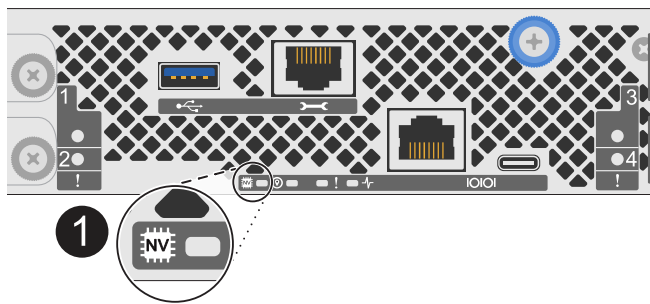
1. On the impaired controller, make sure the NV LED is off.

When the NV LED is off, destaging is complete and it is safe to remove the impaired controller.



If the NV LED is flashing (green), destage is in progress. You must wait for the NV LED to turn off. However, if the flashing continues for longer than five minutes, contact [NetApp Support](#) before continuing with this procedure.

The NV LED is located next to the NV icon on the controller.



1

NV icon and LED on the controller

2. If you are not already grounded, properly ground yourself.
3. Disconnect the power on the impaired controller:



Power supplies (PSUs) do not have a power switch.

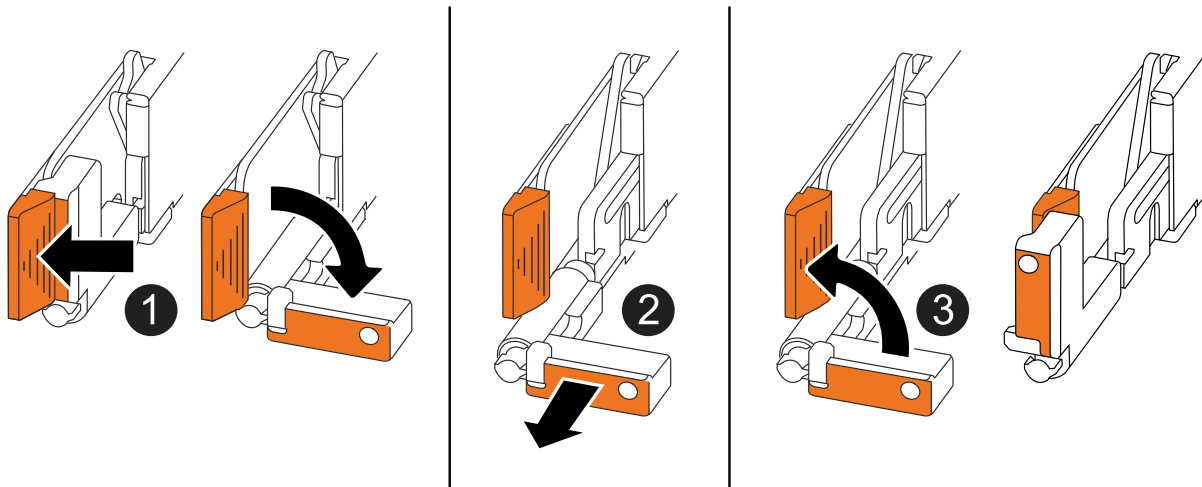
If you are disconnecting a...	Then...
AC PSU	<ol style="list-style-type: none"> 1. Open the power cord retainer. 2. Unplug the power cord from the PSU and set it aside.
DC PSU	<ol style="list-style-type: none"> 1. Unscrew the two thumb screws on the D-SUB DC power cord connector. 2. Unplug the power cord from the PSU and set it aside.

4. Unplug all cables from the impaired controller.

Keep track of where the cables were connected.

5. Remove the impaired controller:

The following illustration shows the operation of the controller handles (from the left side of the controller) when removing a controller:



1	On both ends of the controller, push the vertical locking tabs outward to release the handles.
2	<ul style="list-style-type: none"> • Pull the handles towards you to unseat the controller from the midplane. <p>As you pull, the handles extend out from the controller and then you feel some resistance, keep pulling.</p> <ul style="list-style-type: none"> • Slide the controller out of the chassis while supporting the bottom of the controller, and place it on a flat, stable surface.
3	If needed, rotate the handles upright (next to the tabs) to move them out of the way.

6. Repeat these steps for the other controller in the chassis.

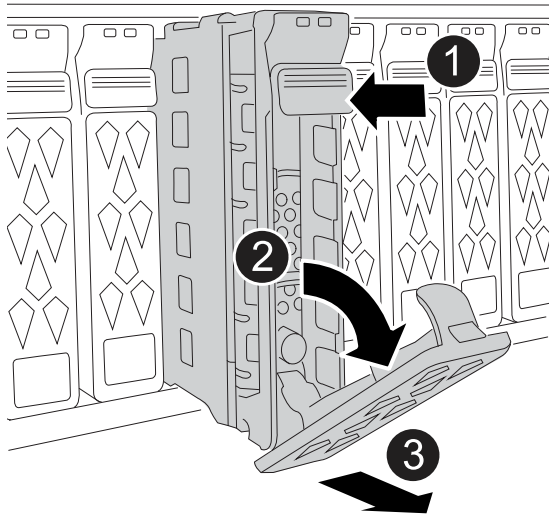
Step 2: Remove the drives from the impaired chassis


You need to remove all of the drives and any drive blanks from the impaired chassis so that later in the procedure you can install them in the replacement chassis.

1. Gently remove the bezel from the front of the storage system.
2. Remove the drives and any drive blanks:



Keep track of what drive bay each drive and drive blank was removed from because they must be installed in the same drive bays in the replacement chassis.



1	Press the release button on the drive face to open the cam handle.
2	Rotate the cam handle downward to disengage the drive from the midplane.
3	<p>Slide the drive out of the drive bay using the cam handle and supporting the drive with your other hand.</p> <p>When removing a drive, always use two hands to support its weight.</p> <p> Because drives are fragile, minimize handling to avoid damaging them.</p>

3. Set the drives aside on a static-free cart or table.

Step 3: Replace the chassis from within the equipment rack or system cabinet

You remove the impaired chassis from the equipment rack or system cabinet, install the replacement chassis, install the drives, any drive blanks and then install the bezel.

1. Remove the screws from the impaired chassis mount points.

Set the screws aside to use later in this procedure.



If the storage system shipped in a NetApp system cabinet, you must remove additional screws at the rear of the chassis before the chassis can be removed.

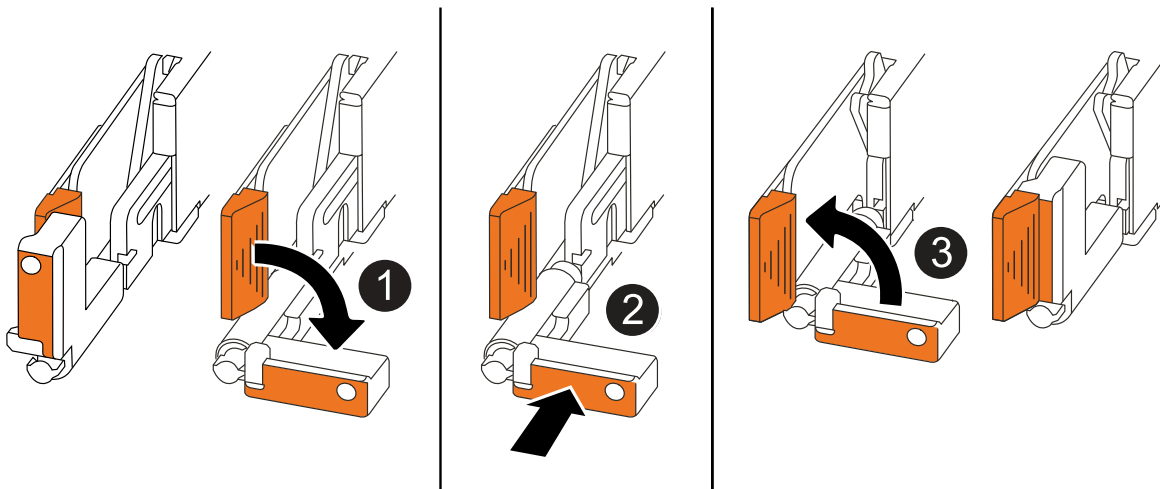
2. Using two people or a power lift, remove the impaired chassis from the equipment rack or system cabinet by sliding it off the rails, and then set it aside.
3. Using two people, install the replacement chassis into the equipment rack or system cabinet by sliding it onto the rails.
4. Secure the front of the replacement chassis to the equipment rack or system cabinet using the screws you removed from the impaired chassis.

Step 4: Install the controllers

Install the controllers into the replacement chassis and reboot them.

About this task

The following illustration shows the operation of the controller handles (from the left side of a controller) when installing a controller, and can be used as a reference for the rest of the controller installation steps.



1	If you rotated the controller handles upright (next to the tabs) to move them out of the way, rotate them down to the horizontal position.
2	Push the handles to reinsert the controller into the chassis and push until the controller is fully seated.
3	Rotate the handles to the upright position and lock in place with the locking tabs.

1. Insert one of the controllers into the chassis:
 - a. Align the back of the controller with the opening in the chassis.
 - b. Firmly push on the handles until the controller meets the midplane and is fully seated in the chassis.



Do not use excessive force when sliding the controller into the chassis; it could damage the connectors.

- c. Rotate the controller handles up and lock in place with the tabs.
2. Recable the controller, as needed, except for the power cords.
3. Repeat these steps to install the second controller into the chassis.
4. Install the drives and any drive blanks you removed from the impaired chassis into the replacement chassis:



The drives and drive blanks must be installed in the same drive bays in the replacement chassis.

- a. With the cam handle in the open position, use both hands to insert the drive.
- b. Gently push until the drive stops.
- c. Close the cam handle so that the drive is fully seated into the midplane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the drive.

- d. Repeat the process for the remaining drives.
5. Install the bezel.
6. Reconnect the power cords to the power supplies (PSU) in the controllers.

Once power is restored to a PSU, the status LED should be green.



The controllers begin to boot as soon as the power is restored.

If you are reconnecting a...	Then...
AC PSU	<ol style="list-style-type: none"> 1. Plug the power cord into the PSU. 2. Secure the power cord with the power cord retainer.
DC PSU	<ol style="list-style-type: none"> 1. Plug the D-SUB DC power cord connector into the PSU. 2. Tighten the two thumb screws to secure the D-SUB DC power cord connector to the PSU.

7. If controllers boot to the LOADER prompt, reboot the controllers:

```
boot_ontap
```

8. Turn AutoSupport back on:

```
system node autosupport invoke -node * -type all -message MAINT=END
```

Complete chassis replacement - AFF C30 and AFF C60

You must verify the HA state of the chassis and return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Step 1: Verify and set the HA state of the chassis

You must verify the HA state of the chassis, and, if necessary, update the state to match your storage system configuration.

1. In Maintenance mode, from either controller, display the HA state of the local controller and chassis:

```
ha-config show
```

The HA state should be the same for all components.

2. If the displayed system state for the chassis does not match your storage system configuration:
 - a. Set the HA state for the chassis:

```
ha-config modify chassis HA-state
```

The value for HA-state should be *ha*.

- b. Confirm that the setting has changed:

```
ha-config show
```

3. If you have not already done so, recable the rest of your storage system.

Step 2: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return and Replacements](#) page for further information.

Controller

Controller replacement workflow - AFF C30 and AFF C60

Follow these workflow steps to replace your controller.

1

Review the controller replacement requirements

To replace the controller, you must meet certain requirements.

2

Shut down the impaired controller

Shut down or take over the impaired controller so that the healthy controller continues to serve data from the impaired controller storage.

3

Replace the controller

Replacing the controller includes removing the impaired controller, moving the FRU components to the replacement controller, and then installing the replacement controller in the enclosure.

4

Restore and verify the system configuration

Verify the low-level system configuration of the replacement controller and reconfigure system settings as necessary.

5

Recable and give back the controller

Recable the controller and transfer the ownership of storage resources back to the replacement controller.

6

Complete controller replacement

Verify the Lifs, check cluster health, and return the failed part to NetApp.

Requirements and considerations - AFF C30 and AFF C60

You must review the requirements and considerations for the controller replacement procedure.

Requirements

- All shelves must be working properly.
- The healthy controller must be able to take over the controller that is being replaced (referred to in this procedure as the “impaired controller”).
- You must replace a controller with a controller of the same model type. You cannot upgrade your system by just replacing the controller.
- You cannot change any drives or shelves as part of this procedure.
- You must always capture the controller’s console output to a text log file.

The console output provides you with a record of the procedure you can use to troubleshoot issues you might encounter during the replacement process.

Considerations

- It is important that you apply the commands in this procedure to the correct controller:
 - The *impaired* controller is the controller that is being replaced.
 - The *replacement* controller is the new controller that is replacing the impaired controller.
 - The *healthy* controller is the surviving controller.
- If needed, you can turn on the storage system location (blue) LEDs to aid in physically locating the affected storage system. Log into the BMC using SSH and enter the `system location-led on` command.

A storage system has three location LEDs: one on the operator display panel and one on each controller. Location LEDs remain illuminated for 30 minutes.

You can turn them off by entering the `system location-led off` command. If you are unsure if the LEDs are on or off, you can check their state by entering the `system location-led show` command.

Shut down the impaired controller - AFF C30 and AFF C60

Shut down or take over the impaired controller.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced mode`) displays the node name, [quorum status](#) of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code> When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i> .

Replace the controller - AFF C30 and AFF C60

To replace the controller, you must remove the impaired controller, move FRU components from the impaired controller to the replacement controller, install the replacement controller in the chassis, set the time and date, and then recable the replacement controller.

Step 1: Remove the controller

You must remove the controller from the chassis when you replace the controller or replace a component inside the controller.

Before you begin

All other components in the storage system must be functioning properly; if not, you must contact [NetApp Support](#) before continuing with this procedure.

Steps

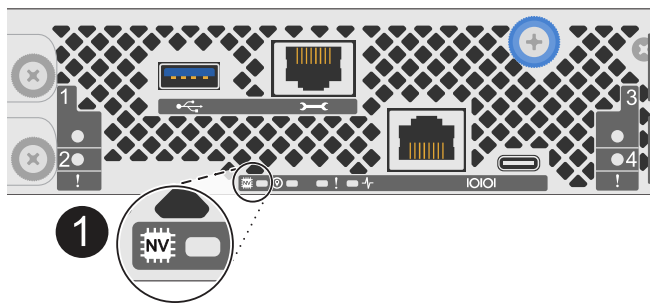
1. On the impaired controller, make sure the NV LED is off.

When the NV LED is off, destaging is complete and it is safe to remove the impaired controller.



If the NV LED is flashing (green), destage is in progress. You must wait for the NV LED to turn off. However, if the flashing continues for longer than five minutes, contact [NetApp Support](#) before continuing with this procedure.

The NV LED is located next to the NV icon on the controller.



1

NV icon and LED on the controller

2. If you are not already grounded, properly ground yourself.
3. Disconnect the power on the impaired controller:



Power supplies (PSUs) do not have a power switch.

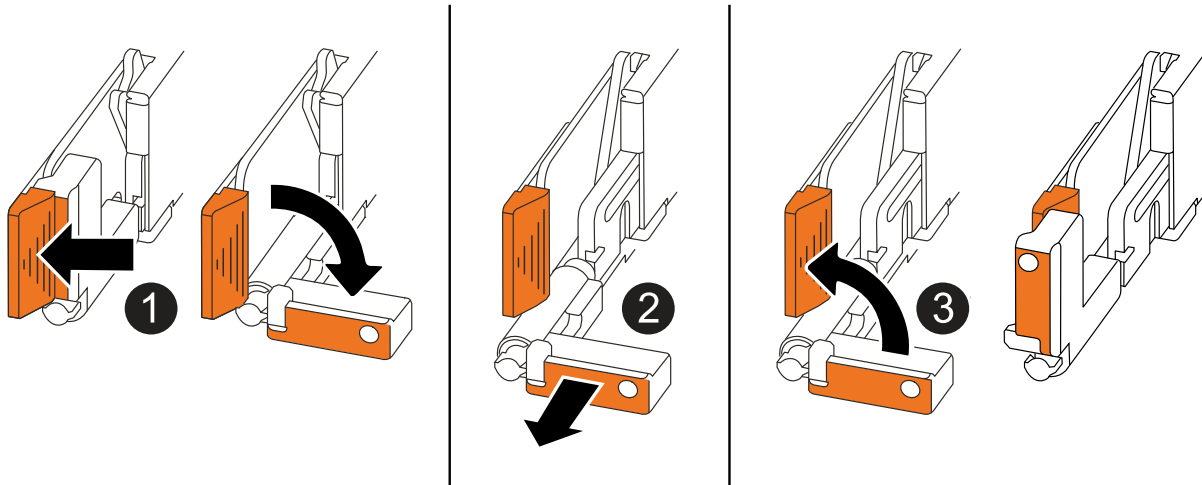
If you are disconnecting a...	Then...
AC PSU	<ol style="list-style-type: none">1. Open the power cord retainer.2. Unplug the power cord from the PSU and set it aside.
DC PSU	<ol style="list-style-type: none">1. Unscrew the two thumb screws on the D-SUB DC power cord connector.2. Unplug the power cord from the PSU and set it aside.

4. Unplug all cables from the impaired controller.

Keep track of where the cables were connected.

5. Remove the impaired controller:

The following illustration shows the operation of the controller handles (from the left side of the controller) when removing a controller:



1	On both ends of the controller, push the vertical locking tabs outward to release the handles.
2	<ul style="list-style-type: none">• Pull the handles towards you to unseat the controller from the midplane. <p>As you pull, the handles extend out from the controller and then you feel some resistance, keep pulling.</p> <ul style="list-style-type: none">• Slide the controller out of the chassis while supporting the bottom of the controller, and place it on a flat, stable surface.
3	If needed, rotate the handles upright (next to the tabs) to move them out of the way.

6. Open the controller cover by turning the thumbscrew counterclockwise to loosen, and then open the cover.

Step 2: Move the power supply

Move the power supply (PSU) to the replacement controller.

1. Move the PSU from the impaired controller:

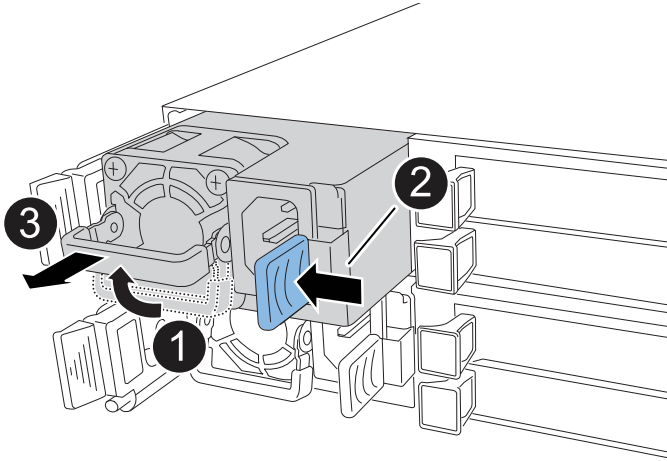
Make sure the left side controller handle is in the upright position to allow you access to the PSU.


Option 1: Move an AC PSU

To move an AC PSU, complete the following steps.

Steps

1. Remove the AC PSU from the impaired controller:



1	Rotate the PSU handle up, to its horizontal position, and then grasp it.
2	With your thumb, press the blue tab to release the PSU from the controller.
3	<p>Pull the PSU out of the controller while using your other hand to support its weight.</p> <p> The PSU is short. Always use two hands to support it when removing it from the controller so that it does not suddenly swing free from the controller and injure you.</p>

2. Insert the PSU into the replacement controller:

- a. Using both hands, support and align the edges of the PSU with the opening in the controller.
- b. Gently push the PSU into the controller until the locking tab clicks into place.

A PSU will only properly engage with the internal connector and lock in place one way.



To avoid damaging the internal connector, do not use excessive force when sliding the PSU into the controller.

- c. Rotate the handle down, so it is out of the way of normal operations.

Option 2: Move a DC PSU

To move a DC PSU, complete the following steps.

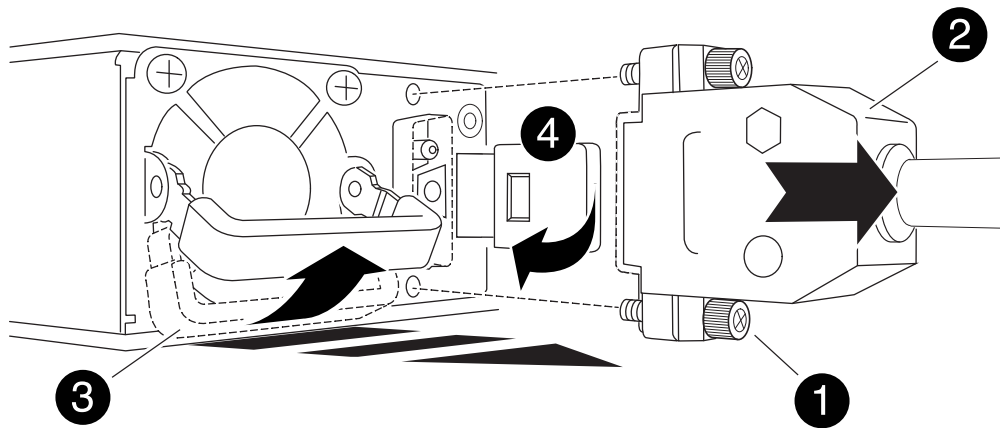
Steps

1. Remove the DC PSU from the impaired controller:

- a. Rotate the handle up, to its horizontal position, and then grasp it.
- b. With your thumb, press the terracotta tab to release the locking mechanism.
- c. Pull the PSU out of the controller while using your other hand to support its weight.



The PSU is short. Always use two hands to support it when removing it from the controller so that it does not swing free from the controller and injure you.



1	Thumb screws
2	D-SUB DC power PSU cord connector
3	Power supply handle
4	Terracotta PSU locking tab

2. Insert the PSU into the replacement controller:
 - a. Using both hands, support and align the edges of the PSU with the opening in the controller.
 - b. Gently slide the PSU into the controller until the locking tab clicks into place.

A PSU must properly engage with the internal connector and locking mechanism. Repeat this step if you feel the PSU is not properly seated.



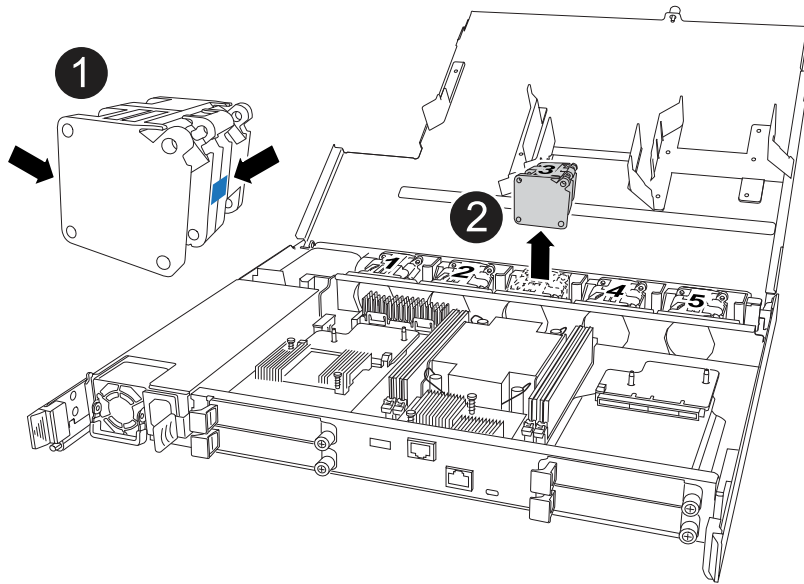
To avoid damaging the internal connector, do not use excessive force when sliding the PSU into the controller.

- c. Rotate the handle down, so it is out of the way of normal operations.

Step 3: Move the fans

Move the fans to the replacement controller.

1. Remove one of the fans from the impaired controller:



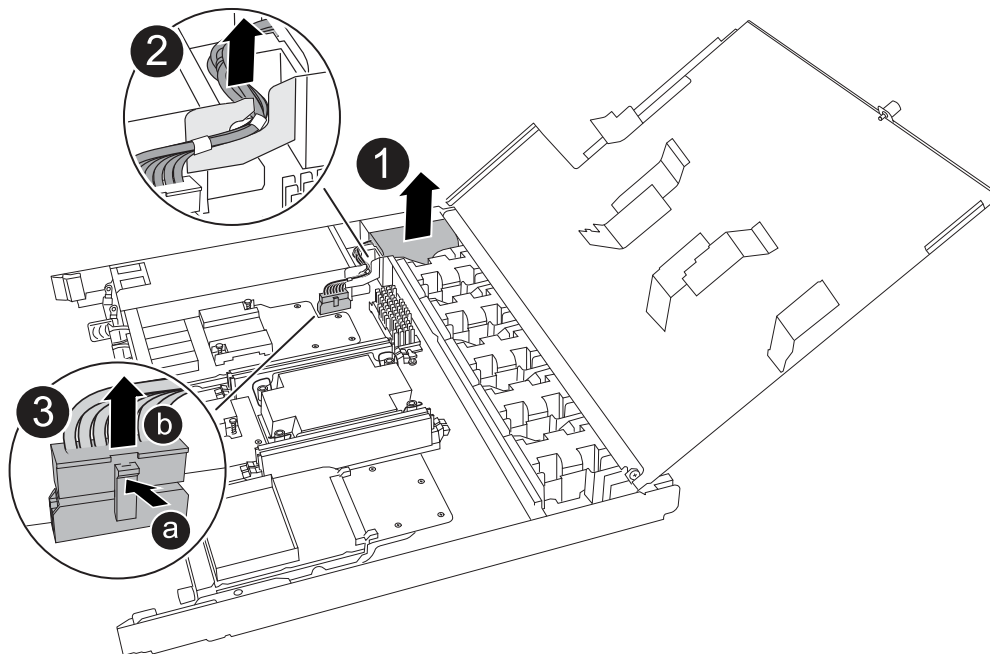
<p>1</p>	<p>Hold both sides of the fan at the blue touch points.</p>
<p>2</p>	<p>Pull the fan straight up and out its socket.</p>

2. Insert the fan into the replacement controller by aligning it within the guides, and then push down until the fan connector is fully seated in the socket.
3. Repeat these steps for the remaining fans.

Step 4: Move the NV battery

Move the NV battery to the replacement controller.

1. Remove the NV battery from the impaired controller:



<p>1</p>	<p>Lift the NV battery up and out of its compartment.</p>
<p>2</p>	<p>Remove the wiring harness from its retainer.</p>
<p>3</p>	<p>1. Push in and hold the tab on the connector. 2. Pull the connector up and out of the socket.</p> <p>As you pull up, gently rock the connector from end to end (lengthwise) to unseat it.</p>

2. Install the NV battery into the replacement controller:

- a. Plug the wiring connector into its socket.
- b. Route the wiring along the side of the power supply, into its retainer, and then through the channel in front of the NV battery compartment.
- c. Place the NV battery into the compartment.

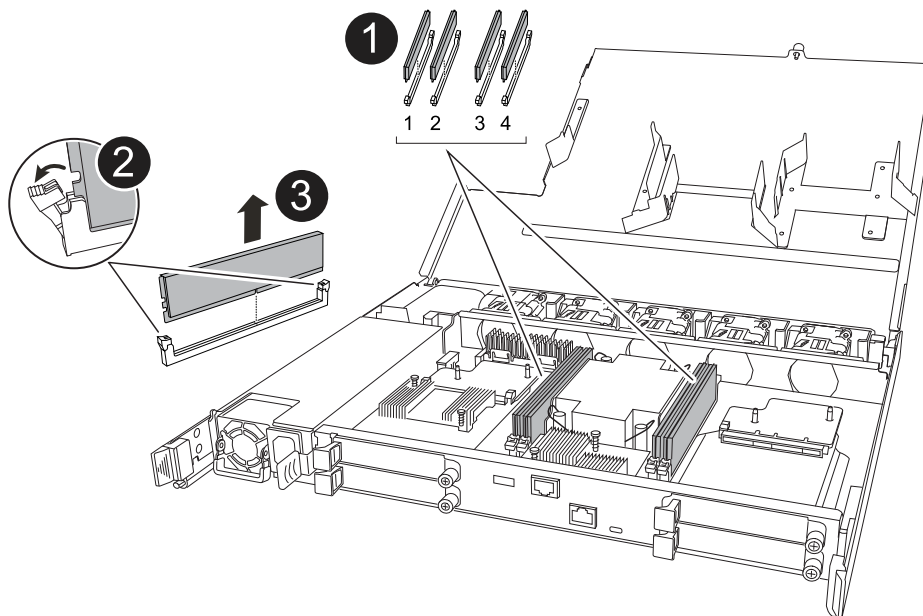
The NV battery should sit flush in its compartment.



Step 5: Move system DIMMs

Move the DIMMs to the replacement controller.

If you have DIMM blanks, you do not need to move them, the replacement controller should come with them installed.

1. Remove one of the DIMMs from the impaired controller:



<p>1</p>	<p>DIMM slot numbering and positions.</p> <p> Depending on your storage system model, you will have two or four DIMMs.</p>
<p>2</p>	<ul style="list-style-type: none"> • Note the orientation of the DIMM in the socket so that you can insert the DIMM in the replacement controller in the proper orientation. • Eject the DIMM by slowly pushing apart the two DIMM ejector tabs on both ends of the DIMM slot. <p> Carefully hold the DIMM by the corners or edges to avoid pressure on the DIMM circuit board components.</p>
<p>3</p>	<p>Lift the DIMM up and out of the slot.</p> <p>The ejector tabs remain in the open position.</p>

2. Install the DIMM in the replacement controller:

- Make sure that the DIMM ejector tabs on the connector are in the open position.
- Hold the DIMM by the corners, and then insert the DIMM squarely into the slot.

The notch on the bottom of the DIMM, among the pins, should line up with the tab in the slot.

When inserted correctly, the DIMM should go in easily but fit tightly in the slot. If not, reinsert the DIMM.

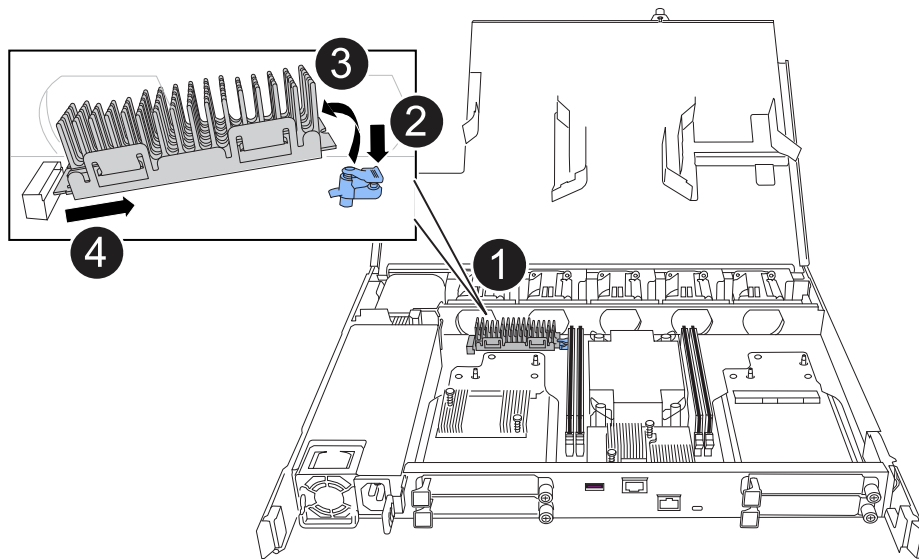
- Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.
- Push down carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at both ends of the DIMM.

3. Repeat these steps for the remaining DIMMs.

Step 6: Move the boot media

Move the boot media to the replacement controller.

1. Remove the boot media from the impaired controller:



1	Boot media location
2	Press down on the blue tab to release the right end of the boot media.
3	Lift the right end of the boot media up at a slight angle to get a good grip along the sides of the boot media.
4	Gently pull the left end of the boot media out of its socket.

2. Install the boot media into the replacement controller:

- a. Slide the socket end of the boot media into its socket.
- b. At the opposite end of the boot media, press down and hold the blue tab (in the open position), gently push down on that end of the boot media until it stops, and then release the tab to lock the boot media into place.

Step 7: Move the I/O modules

Move the I/O modules and any I/O blanking modules to the replacement controller.

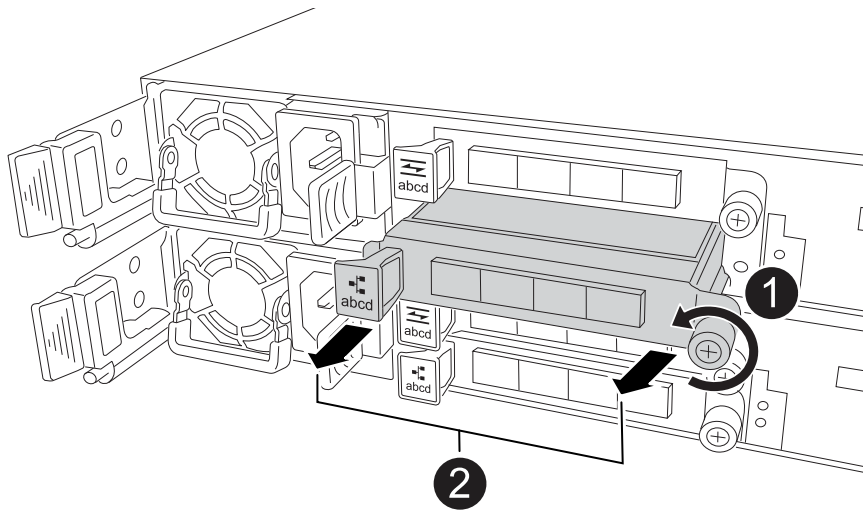
1. Unplug cabling from one of the I/O modules.

Make sure to label the cables so that you know where they came from.

2. Remove the I/O module from the impaired controller:

Make sure that you keep track of which slot the I/O module was in.

If you are removing the I/O module in slot 4, make sure the right side controller handle is in the upright position to allow you access to the I/O module.



<p>1</p>	<p>Turn the I/O module thumbscrew counterclockwise to loosen.</p>
<p>2</p>	<p>Pull the I/O module out of the controller using the port label tab on the left and the thumbscrew.</p>

3. Install the I/O module into the replacement controller:

- a. Align the I/O module with the edges of the slot.
- b. Gently push the I/O module all the way into the slot, making sure to properly seat the module into the connector.

You can use the tab on the left and the thumbscrew to push in the I/O Module.

- c. Turn the thumbscrew clockwise to tighten.

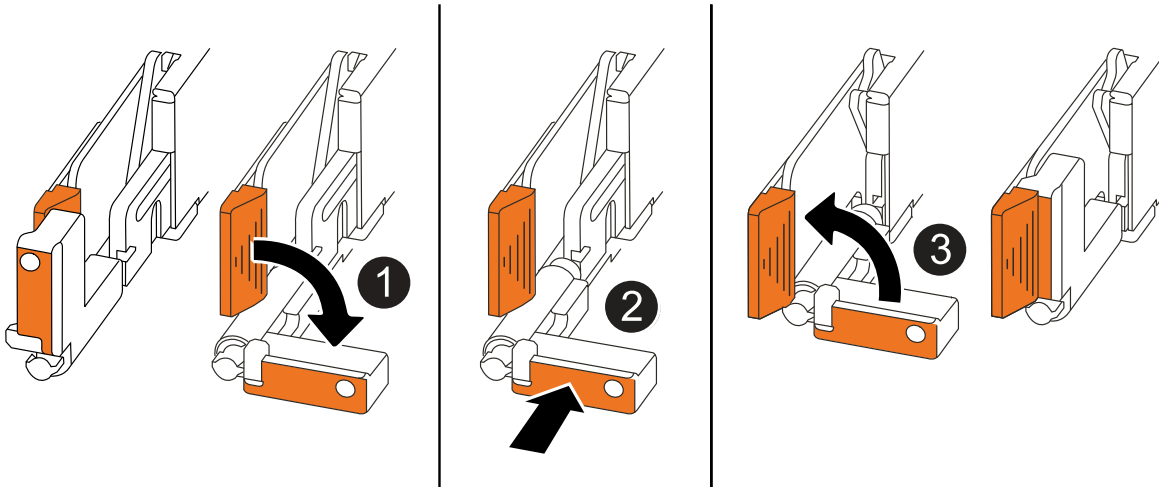
4. Repeat these steps to move the remaining I/O modules and any I/O blanking modules to the replacement controller.

Step 8: Install the controller

Reinstall the controller into the chassis and reboot it.

About this task

The following illustration shows the operation of the controller handles (from the left side of a controller) when reinstalling the controller, and can be used as a reference for the rest of the controller reinstallation steps.



1	If you rotated the controller handles upright (next to the tabs) to move them out of the way while you serviced the controller, rotate them down to the horizontal position.
2	Push the handles to reinsert the controller into the chassis halfway and then, when instructed, push until the controller is fully seated.
3	Rotate the handles to the upright position and lock in place with the locking tabs.

Steps

1. Close the controller cover and turn the thumbscrew clockwise until tightened.
2. Insert the controller halfway into the chassis.

Align the rear of the controller with the opening in the chassis, and then gently push the controller using the handles.



Do not completely insert the controller in the chassis until instructed to do so.

3. Connect the console cable to the console port on the controller and to the laptop so that the laptop receives console messages when the controller reboots.
4. Fully seat the controller in the chassis:
 - a. Firmly push on the handles until the controller meets the midplane and is fully seated.



Do not use excessive force when sliding the controller into the chassis; it could damage the connectors.

- b. Rotate the controller handles up and lock in place with the tabs.



The controller begins to boot as soon as it is fully seated in the chassis.

5. Take the controller to the LOADER prompt by pressing CTRL-C to abort AUTOBOOT.
6. Set the time and date on the controller:

Make sure you are at the controller's LOADER prompt.

a. Display the date and time on the controller:

```
show date
```



Time and date default is in GMT. You have the option to display in local time and in 24hr mode.

b. Set the current time in GMT:

```
set time hh:mm:ss
```

You can get the current GMT from the healthy node:

```
date -u
```

c. Set the current date in GMT:

```
set date mm/dd/yyyy
```

You can get the current GMT from the healthy node:

```
date -u
```

7. Recable the controller as needed.

8. Reconnect the power cord to the power supply (PSU).

Once power is restored to the PSU, the status LED should be green.

If you are reconnecting a...	Then...
AC PSU	<ol style="list-style-type: none">1. Plug the power cord into the PSU.2. Secure the power cord with the power cord retainer.
DC PSU	<ol style="list-style-type: none">1. Plug the D-SUB DC power cord connector into the PSU.2. Tighten the two thumb screws to secure the D-SUB DC power cord connector to the PSU.

Restore and verify the system configuration - AFF C30 and AFF C60

Verify the low-level system configuration of the replacement controller and reconfigure the system settings as necessary.

Step 1: Verify HA config settings

You must verify the HA state of the controller and, if necessary, update the state to match your storage system configuration.

1. Boot to maintenance mode:

```
boot_ontap maint
```


a. Enter `y` when you see *Continue with boot?*.

If you see the *System ID mismatch* warning message, enter `y`.

2. Enter `sysconfig -v` and capture the display contents.



If you see *PERSONALITY MISMATCH* contact customer support.

3. From the `sysconfig -v` output, compare the adapter card information with the cards and locations in the replacement controller.

4. Verify that all components display the same HA state:

```
ha-config show
```

The HA state should be the same for all components.

5. If the displayed system state of the controller does not match your storage system configuration, set the HA state for the controller:

```
ha-config modify controller ha-state
```

The value for HA-state can be one of the following:

- `ha`

- `non-ha` (not supported)

6. Confirm that the setting has changed:

```
ha-config show
```

Step 2: Verify disk list

1. Verify that the adapter lists the paths to all disks:

```
storage show disk -p
```

If you see any issues, check cabling and reseal cables.

2. Exit Maintenance mode:

```
halt
```

Recable and give back the controller - AFF C30 and AFF C60

Give back the controller.

Give back the controller

Reset encryption if enabled and return the controller to normal operation.

No encryption

1. From the LOADER prompt, enter `boot_ontap`.
2. Press <enter> when console messages stop.
 - If you see the *login* prompt, go to the next step at the end of this section.
 - If you see *Waiting for giveback*, press the <enter> key, log into the partner node, and then go to the next step at the end of this section.
3. Return the impaired controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
4. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`
5. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`

Onboard encryption (OKM)

1. From the LOADER prompt, enter `boot_ontap maint`.
2. Boot to the ONTAP menu from the LOADER prompt `boot_ontap menu` and select option 10.
3. Enter the OKM passphrase.



You are prompted twice for the passphrase.

4. Enter the backup key data when prompted.
5. At the boot menu, enter option 1 for normal boot.
6. Press <enter> when *Waiting for giveback* is displayed.
7. Move the console cable to the partner node and login as `admin`.
8. Give back only the CFO aggregates (the root aggregate): `storage failover giveback -fromnode local -only-cfo-aggregates true`
 - If you encounter errors, contact [NetApp Support](#).
9. Wait 5 minutes after the giveback report completes, and check failover status and giveback status: `storage failover show` and `storage failover show-giveback`.
10. Synchronize and verify status of the keys:
 - a. Move the console cable back to the replacement controller.
 - b. Synchronize missing keys: `security key-manager onboard sync`



You are prompted for the cluster-wide passphrase of OKM for the cluster.

- c. Verify status of the keys: `security key-manager key query -restored false`

The output should show no results when when properly synchronized.

If the output shows results (the key IDs of keys that are not present in the system's internal key table), contact [NetApp Support](#).

11. Return the impaired controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
12. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`
13. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`

External key manager (EKM)

1. If the root volume is encrypted with External Key Manager and the console cable is connected to the replacement node, enter `boot_ontap` menu and select option 11.
2. Answer `y` or `n` to the following questions:

Do you have a copy of the `/cfcard/kmip/certs/client.crt` file? {y/n}

Do you have a copy of the `/cfcard/kmip/certs/client.key` file? {y/n}

Do you have a copy of the `/cfcard/kmip/certs/CA.pem` file? {y/n}

OR

Do you have a copy of the `/cfcard/kmip/servers.cfg` file? {y/n}

Do you know the KMIP server address? {y/n}

Do you know the KMIP port? {y/n}



Contact [NetApp Support](#) if you have issues.

3. Supply the information for:
 - The client certificate (`client.crt`) file contents
 - The client key (`client.key`) file contents
 - The KMIP server CA(s) (`CA.pem`) file contents
 - The IP address for the KMIP server
 - The port for the KMIP server
4. Once the system processes, you see the Boot Menu. Select '1' for normal boot.
5. Check the takeover status: `storage failover show`
6. Ensure any core dumps on the repaired node are saved by going to advanced mode `set -privilege advanced` and then run `local partner nosavecore`.
7. Return the impaired controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
8. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`
9. If AutoSupport is enabled, restore/unsuppress automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`

Complete controller replacement - AFF C30 and AFF C60

To restore your storage system to full operation, you must verify the LIFs, check cluster health, and return the failed part to NetApp.

Step 1: Verify LIFs and check cluster health

Before returning the *replacement* node to service, you should verify that the LIFs are on their home ports, check the cluster health, and reset automatic giveback.

Steps

1. Verify that the logical interfaces are reporting to their home server and ports: `network interface show -is-home false`

If any LIFs are listed as false, revert them to their home ports: `network interface revert -vserver * -lif *`

2. Check the health of your cluster. See the [How to perform a cluster health check with a script in ONTAP KB](#) article for more information.
3. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

Step 2: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return and Replacements](#) page for further information.

Replace a DIMM - AFF C30 and AFF C60

You must replace a DIMM in the controller when your storage system encounters errors such as, excessive CECC (Correctable Error Correction Codes) errors that are based on Health Monitor alerts or uncorrectable ECC errors, typically caused by a single DIMM failure preventing the storage system from booting ONTAP.

Before you begin

- All other components in the storage system must be functioning properly; if not, you must contact [NetApp Support](#) before continuing with this procedure.
- You must replace the failed FRU component with a replacement FRU component you received from your provider.

About this task

If needed, you can turn on the storage system location (blue) LEDs to aid in physically locating the affected storage system. Log into the BMC using SSH and enter the `system location-led on` command.

A storage system has three location LEDs: one on the operator display panel and one on each controller. Location LEDs remain illuminated for 30 minutes.

You can turn them off by entering the `system location-led off` command. If you are unsure if the LEDs are on or off, you can check their state by entering the `system location-led show` command.

Step 1: Shut down the impaired controller

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, [quorum status](#) of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`
`system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode impaired_node_name</code> When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i> .

Step 2: Remove the controller

You must remove the controller from the chassis when you replace the controller or replace a component inside the controller.

Before you begin

All other components in the storage system must be functioning properly; if not, you must contact [NetApp Support](#) before continuing with this procedure.

Steps

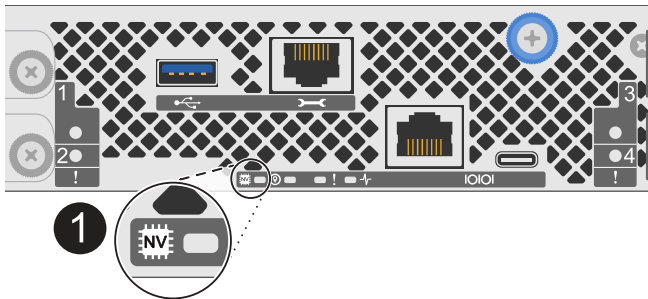
1. On the impaired controller, make sure the NV LED is off.

When the NV LED is off, destaging is complete and it is safe to remove the impaired controller.



If the NV LED is flashing (green), destage is in progress. You must wait for the NV LED to turn off. However, if the flashing continues for longer than five minutes, contact [NetApp Support](#) before continuing with this procedure.

The NV LED is located next to the NV icon on the controller.



1	NV icon and LED on the controller
----------	-----------------------------------

2. If you are not already grounded, properly ground yourself.
3. Disconnect the power on the impaired controller:



Power supplies (PSUs) do not have a power switch.

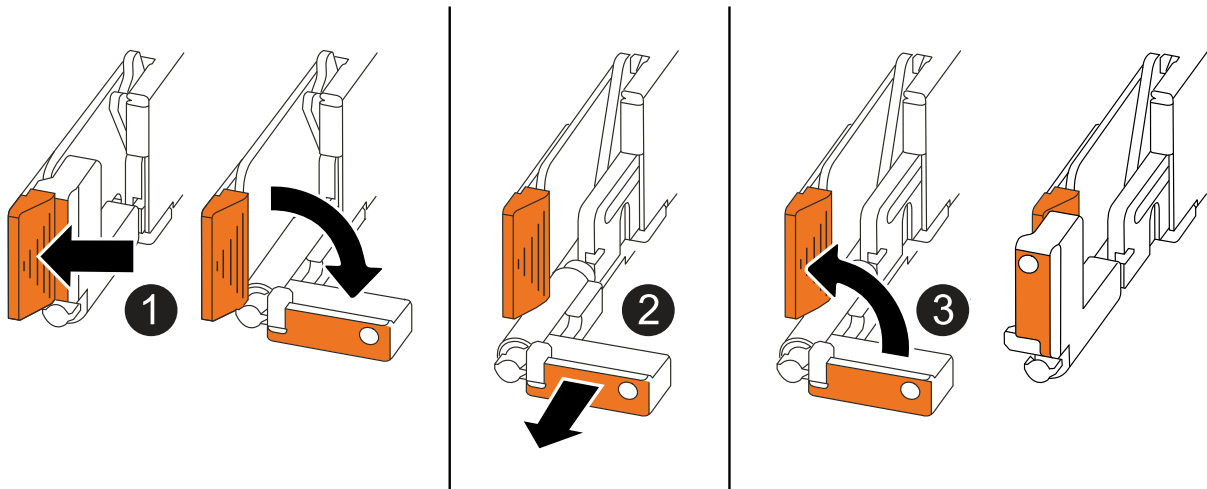
If you are disconnecting a...	Then...
AC PSU	<ol style="list-style-type: none">1. Open the power cord retainer.2. Unplug the power cord from the PSU and set it aside.
DC PSU	<ol style="list-style-type: none">1. Unscrew the two thumb screws on the D-SUB DC power cord connector.2. Unplug the power cord from the PSU and set it aside.

4. Unplug all cables from the impaired controller.

Keep track of where the cables were connected.

5. Remove the impaired controller:

The following illustration shows the operation of the controller handles (from the left side of the controller) when removing a controller:



<p>1</p>	<p>On both ends of the controller, push the vertical locking tabs outward to release the handles.</p>
<p>2</p>	<ul style="list-style-type: none"> • Pull the handles towards you to unseat the controller from the midplane. <p>As you pull, the handles extend out from the controller and then you feel some resistance, keep pulling.</p> <ul style="list-style-type: none"> • Slide the controller out of the chassis while supporting the bottom of the controller, and place it on a flat, stable surface.
<p>3</p>	<p>If needed, rotate the handles upright (next to the tabs) to move them out of the way.</p>

6. Open the controller cover by turning the thumbscrew counterclockwise to loosen, and then open the cover.

Step 3: Replace a DIMM

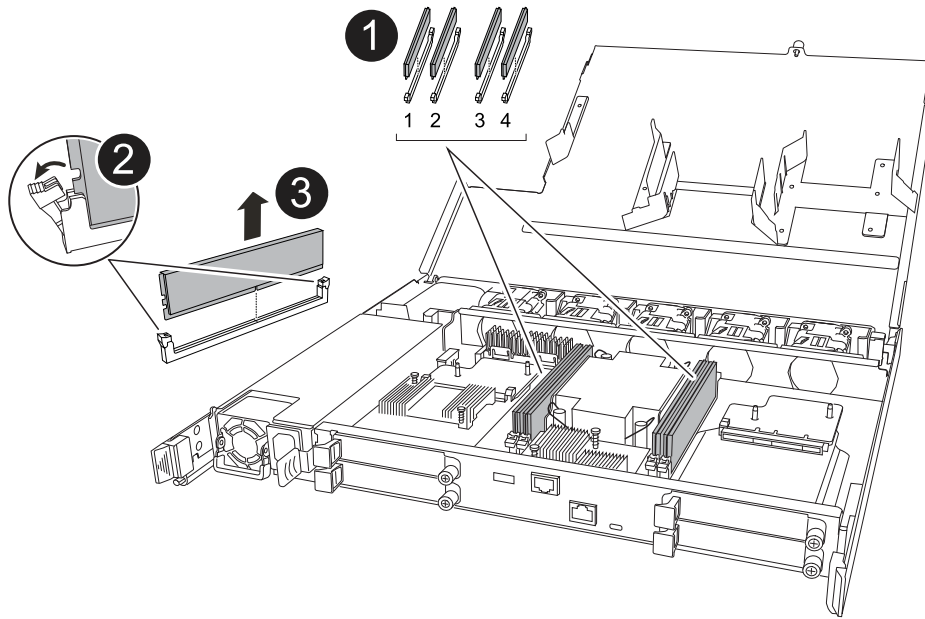
To replace a DIMM, locate the faulty DIMM inside the controller and follow the specific sequence of steps.

1. If you are not already grounded, properly ground yourself.
2. Locate the DIMMs on your controller and identify the faulty DIMM.



Consult either the [Netapp Hardware Universe](#) or the FRU map on the cover of the controller for exact DIMM locations.

3. Remove the faulty DIMM:



<p>1</p>	<p>DIMM slot numbering and positions.</p> <p>i Depending on your storage system model you will have two or four DIMMs.</p>
<p>2</p>	<ul style="list-style-type: none"> • Note the orientation of the DIMM in the socket so that you can insert the replacement DIMM using the same orientation. • Eject the faulty DIMM by slowly pushing apart the two DIMM ejector tabs on both ends of the DIMM slot. <p>i Carefully hold the DIMM by the corners or edges to avoid pressure on the DIMM circuit board components.</p>
<p>3</p>	<p>Lift the DIMM up and out of the slot.</p> <p>The ejector tabs remain in the open position.</p>

4. Install the replacement DIMM:

- Remove the replacement DIMM from its antistatic shipping bag.
- Make sure that the DIMM ejector tabs on the connector are in the open position.
- Hold the DIMM by the corners, and then insert the DIMM squarely into the slot.

The notch on the bottom of the DIMM, among the pins, should line up with the tab in the slot.

When inserted correctly, the DIMM should go in easily but fit tightly in the slot. If not, reinsert the DIMM.

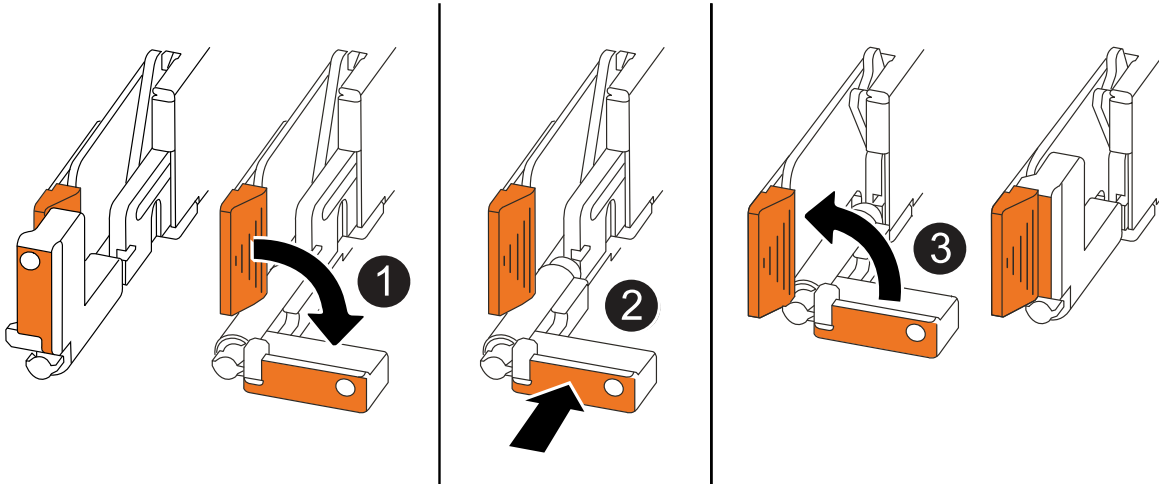
- Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot.
- Push down carefully, but firmly, on the top edge of the DIMM until the ejector tabs snap into place over the notches at both ends of the DIMM.

Step 4: Reinstall the controller

Reinstall the controller into the chassis and reboot it.

About this task

The following illustration shows the operation of the controller handles (from the left side of a controller) when reinstalling the controller, and can be used as a reference for the rest of the controller reinstallation steps.



1	If you rotated the controller handles upright (next to the tabs) to move them out of the way while you serviced the controller, rotate them down to the horizontal position.
2	Push the handles to reinsert the controller into the chassis halfway and then, when instructed, push until the controller is fully seated.
3	Rotate the handles to the upright position and lock in place with the locking tabs.

Steps

1. Close the controller cover and turn the thumbscrew clockwise until tightened.
2. Insert the controller halfway into the chassis.

Align the rear of the controller with the opening in the chassis, and then gently push the controller using the handles.



Do not completely insert the controller in the chassis until instructed to do so.

3. Connect the console cable to the console port on the controller and to the laptop so that the laptop receives console messages when the controller reboots.
4. Fully seat the controller in the chassis:
 - a. Firmly push on the handles until the controller meets the midplane and is fully seated.



Do not use excessive force when sliding the controller into the chassis; it could damage the connectors.

- b. Rotate the controller handles up and lock in place with the tabs.



The controller begins to boot as soon as it is fully seated in the chassis.

5. Take the controller to the LOADER prompt by pressing CTRL-C to abort AUTOBOOT.
6. Set the time and date on the controller:

Make sure you are at the controller's LOADER prompt.

- a. Display the date and time on the controller:

```
show date
```



Time and date default is in GMT. You have the option to display in local time and in 24hr mode.

- b. Set the current time in GMT:

```
set time hh:mm:ss
```

You can get the current GMT from the healthy node:

```
date -u
```

- c. Set the current date in GMT:

```
set date mm/dd/yyyy
```

You can get the current GMT from the healthy node:

```
date -u
```

7. Recable the controller as needed.
8. Reconnect the power cord to the power supply (PSU).

Once power is restored to the PSU, the status LED should be green.

If you are reconnecting a...	Then...
AC PSU	<ol style="list-style-type: none"> 1. Plug the power cord into the PSU. 2. Secure the power cord with the power cord retainer.
DC PSU	<ol style="list-style-type: none"> 1. Plug the D-SUB DC power cord connector into the PSU. 2. Tighten the two thumb screws to secure the D-SUB DC power cord connector to the PSU.

Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return and Replacements](#) page for further information.

Replace Drive - AFF C30 and AFF C60

You can replace a failed drive nondisruptively while I/O is in progress.

Before you begin

- The drive that you are installing must be supported by your storage system.

[NetApp Hardware Universe](#)

- If self-encrypting drive (SED) authentication is enabled, you must use the SED replacement instructions in the ONTAP documentation.

Instructions in the ONTAP documentation describe additional steps you must perform before and after replacing an SED.

[NetApp encryption overview with the CLI](#)

- All other components in the storage system must be functioning properly, if not, you must contact [NetApp Support](#) before continuing with this procedure.
- Verify that the drive you are removing is failed.

You can verify that the drive is failed by running the `storage disk show -broken` command. The failed drive appears in the list of failed drives. If it does not, you should wait, and then run the command again.



Depending on the drive type and capacity, it can take up to several hours for the drive to appear in the list of failed drives.

About this task

- When replacing a failed drive, you must wait 70 seconds between the removal of the drive and the insertion of the replacement drive to allow the storage system to recognize that a drive was removed.
- The best practice is to have the current version of the Disk Qualification Package (DQP) installed before hot-swapping a drive.

Having the current version of the DQP installed allows your system to recognize and use newly qualified drives. This avoids system event messages about having noncurrent drive information and prevention of drive partitioning because drives are not recognized. The DQP also notifies you of noncurrent drive firmware.

[NetApp Downloads: Disk Qualification Package](#)

- The best practice is to have current versions of NVMe shelf module (NSM) firmware and drive firmware on your system before replacing FRU components.

[NetApp Downloads: Disk Shelf Firmware](#)

[NetApp Downloads: Disk Drive Firmware](#)



Do not revert firmware to a version that does not support your shelf and its components.

- Drive firmware is automatically updated (nondisruptively) on new drives that have non-current firmware versions.



Drive firmware checks occur every two minutes.

- If needed, you can turn on the storage system location (blue) LEDs to aid in physically locating the affected storage system. Log into the BMC using SSH and enter the `system location-led on` command.

A storage system has three location LEDs: one on the operator display panel and one on each controller. Location LEDs remain illuminated for 30 minutes.

You can turn them off by entering the `system location-led off` command. If you are unsure if the LEDs are on or off, you can check their state by entering the `system location-led show` command.

Steps

1. If you want to manually assign drive ownership for the replacement drive, you need to disable automatic drive assignment if it is enabled.



You manually assign drive ownership and then reenable automatic drive assignment later in this procedure.

- a. Verify whether automatic drive assignment is enabled:

```
storage disk option show
```

You can enter the command on either controller.

If automatic drive assignment is enabled, the output shows `on` in the `Auto Assign` column (for each controller).

- b. If automatic drive assignment is enabled, disable it:

```
storage disk option modify -node node_name -autoassign off
```

You must disable automatic drive assignment on both controllers.

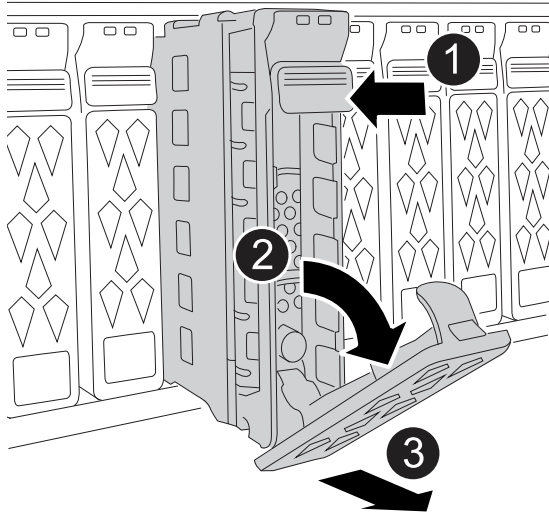
2. Properly ground yourself.
3. Physically identify the failed drive.


When a drive fails, the system logs a warning message to the system console indicating which drive failed. Additionally, the attention (amber) LED on the drive shelf operator display panel and the failed drive illuminate.



The activity (green) LED on a failed drive can be illuminated (solid), which indicates that the drive has power, but should not be blinking, which indicates I/O activity. A failed drive has no I/O activity.

4. Remove the failed drive:



1	Press the release button on the drive face to open the cam handle.
2	Rotate the cam handle downward to disengage the drive from the midplane.
3	<p>Slide the drive out of the drive bay using the cam handle and supporting the drive with your other hand.</p> <p>When removing a drive, always use two hands to support its weight.</p> <div style="border-left: 1px solid black; padding-left: 10px; margin-left: 20px;"> <p> Because drives are fragile, minimize handling to avoid damaging them.</p> </div>

5. Wait a minimum of 70 seconds before inserting the replacement drive.

6. Insert the replacement drive:

- a. With the cam handle in the open position, use both hands to insert the drive.
- b. Gently push until the drive stops.
- c. Close the cam handle so that the drive is fully seated into the midplane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the drive.

7. Verify that the drive's activity (green) LED is illuminated.

When the drive's activity LED is solid, it means that the drive has power. When the drive's activity LED is blinking, it means that the drive has power and I/O is in progress. If the drive firmware is automatically updating, the LED blinks.

8. If you are replacing another drive, repeat steps 3 through step 7.

9. If you disabled automatic drive assignment in step 1, manually assign drive ownership, and then reenable automatic drive assignment if needed:

- a. Display all unowned drives:

```
storage disk show -container-type unassigned
```

You can enter the command on either controller.

b. Assign each drive:

```
storage disk assign -disk disk_name -owner owner_name
```

You can enter the command on either controller.

You can use the wildcard character to assign more than one drive at once.

c. Reenable automatic drive assignment if needed:

```
storage disk option modify -node node_name -autoassign on
```

You must reenable automatic drive assignment on both controllers.

10. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Contact technical support at [NetApp Support](#), 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

Replace a fan module - AFF C30 and AFF C60

To replace a fan, you must remove the controller, remove the faulty fan, install the replacement fan, and then reinstall the controller.

About this task

If needed, you can turn on the storage system location (blue) LEDs to aid in physically locating the affected storage system. Log into the BMC using SSH and enter the `system location-led on` command.

A storage system has three location LEDs: one on the operator display panel and one on each controller. Location LEDs remain illuminated for 30 minutes.

You can turn them off by entering the `system location-led off` command. If you are unsure if the LEDs are on or off, you can check their state by entering the `system location-led show` command.

Step 1: Shut down the impaired controller

Shut down or take over the impaired controller.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, [quorum status](#) of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be

resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:>`
`system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter `y`.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode impaired_node_name</code> When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code> .

Step 2: Remove the controller

You must remove the controller from the chassis when you replace the controller or replace a component inside the controller.

Before you begin

All other components in the storage system must be functioning properly; if not, you must contact [NetApp Support](#) before continuing with this procedure.

Steps

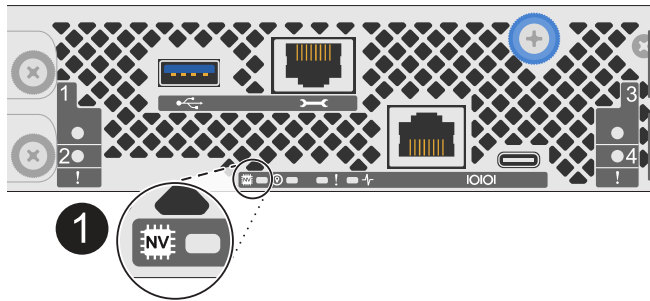
1. On the impaired controller, make sure the NV LED is off.

When the NV LED is off, destaging is complete and it is safe to remove the impaired controller.



If the NV LED is flashing (green), destage is in progress. You must wait for the NV LED to turn off. However, if the flashing continues for longer than five minutes, contact [NetApp Support](#) before continuing with this procedure.

The NV LED is located next to the NV icon on the controller.



1	NV icon and LED on the controller
----------	-----------------------------------

2. If you are not already grounded, properly ground yourself.
3. Disconnect the power on the impaired controller:



Power supplies (PSUs) do not have a power switch.

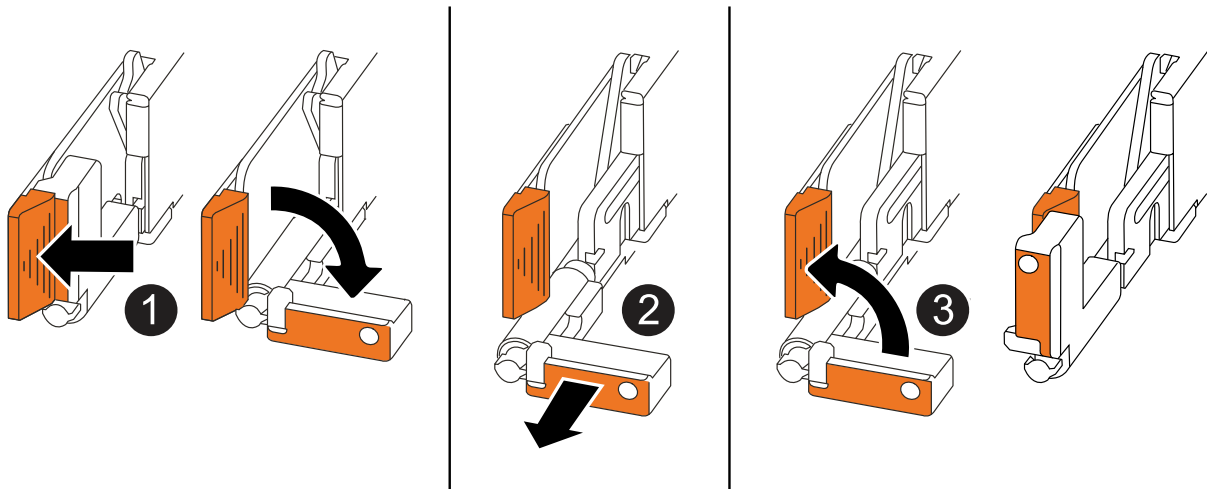
If you are disconnecting a...	Then...
AC PSU	<ol style="list-style-type: none"> 1. Open the power cord retainer. 2. Unplug the power cord from the PSU and set it aside.
DC PSU	<ol style="list-style-type: none"> 1. Unscrew the two thumb screws on the D-SUB DC power cord connector. 2. Unplug the power cord from the PSU and set it aside.

4. Unplug all cables from the impaired controller.

Keep track of where the cables were connected.

5. Remove the impaired controller:

The following illustration shows the operation of the controller handles (from the left side of the controller) when removing a controller:



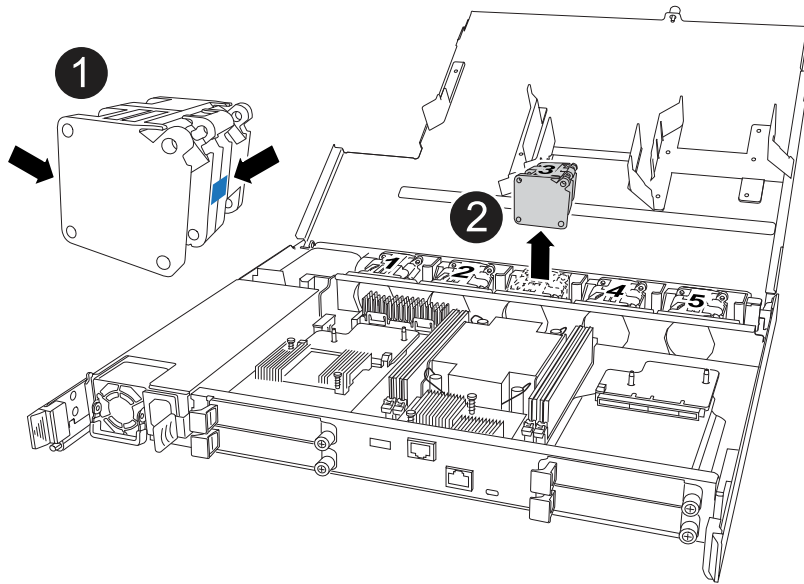
<p>1</p>	<p>On both ends of the controller, push the vertical locking tabs outward to release the handles.</p>
<p>2</p>	<ul style="list-style-type: none"> • Pull the handles towards you to unseat the controller from the midplane. <p>As you pull, the handles extend out from the controller and then you feel some resistance, keep pulling.</p> <ul style="list-style-type: none"> • Slide the controller out of the chassis while supporting the bottom of the controller, and place it on a flat, stable surface.
<p>3</p>	<p>If needed, rotate the handles upright (next to the tabs) to move them out of the way.</p>

6. Open the controller cover by turning the thumbscrew counterclockwise to loosen, and then open the cover.

Step 3: Replace fan

To replace a fan, remove the failed fan and replace it with a new fan.

1. Identify the fan that you must replace by checking the console error messages.
2. Remove the failed fan:



<p>1</p>	<p>Hold both sides of the fan at the blue touch points.</p>
<p>2</p>	<p>Pull the fan straight up and out its socket.</p>

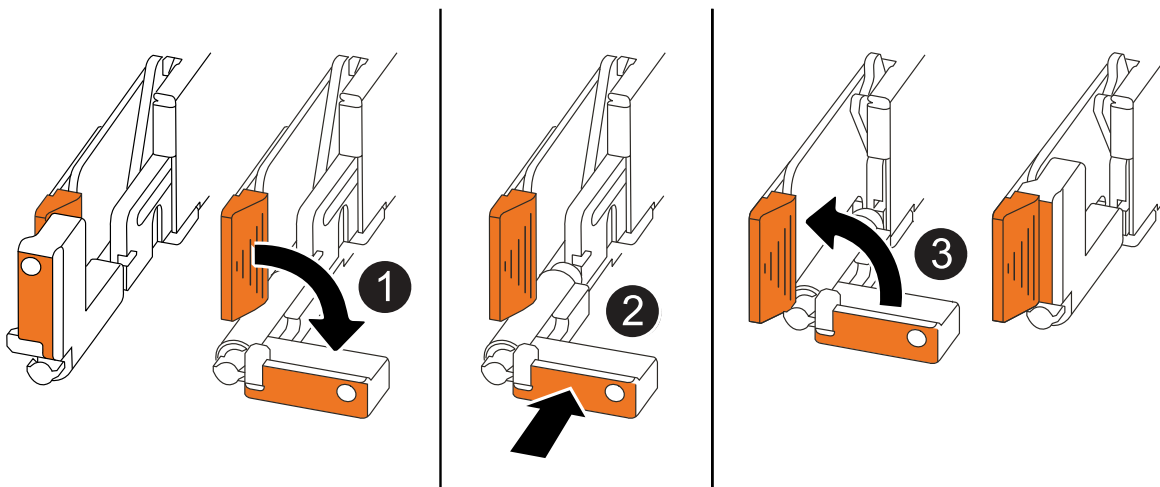
3. Insert the replacement fan by aligning it within the guides, and then push down until the fan connector is fully seated in the socket.

Step 4: Reinstall the controller module

Reinstall the controller into the chassis and reboot it.

About this task

The following illustration shows the operation of the controller handles (from the left side of a controller) when reinstalling the controller, and can be used as a reference for the rest of the controller reinstallation steps.



1	If you rotated the controller handles upright (next to the tabs) to move them out of the way while you serviced the controller, rotate them down to the horizontal position.
2	Push the handles to reinsert the controller into the chassis halfway and then, when instructed, push until the controller is fully seated.
3	Rotate the handles to the upright position and lock in place with the locking tabs.

Steps

1. Close the controller cover and turn the thumbscrew clockwise until tightened.
2. Insert the controller halfway into the chassis.

Align the rear of the controller with the opening in the chassis, and then gently push the controller using the handles.



Do not completely insert the controller in the chassis until instructed to do so.

3. Connect the console cable to the console port on the controller and to the laptop so that the laptop receives console messages when the controller reboots.
4. Fully seat the controller in the chassis:
 - a. Firmly push on the handles until the controller meets the midplane and is fully seated.



Do not use excessive force when sliding the controller into the chassis; it could damage the connectors.

- b. Rotate the controller handles up and lock in place with the tabs.



The controller begins to boot as soon as it is fully seated in the chassis.

5. Take the controller to the LOADER prompt by pressing CTRL-C to abort AUTOBOOT.
6. Set the time and date on the controller:

Make sure you are at the controller's LOADER prompt.

- a. Display the date and time on the controller:

```
show date
```



Time and date default is in GMT. You have the option to display in local time and in 24hr mode.

- b. Set the current time in GMT:

```
set time hh:mm:ss
```

You can get the current GMT from the healthy node:

```
date -u
```

c. Set the current date in GMT:

```
set date mm/dd/yyyy
```

You can get the current GMT from the healthy node:

```
date -u
```

7. Recable the controller as needed.
8. Reconnect the power cord to the power supply (PSU).

Once power is restored to the PSU, the status LED should be green.

If you are reconnecting a...	Then...
AC PSU	<ol style="list-style-type: none">1. Plug the power cord into the PSU.2. Secure the power cord with the power cord retainer.
DC PSU	<ol style="list-style-type: none">1. Plug the D-SUB DC power cord connector into the PSU.2. Tighten the two thumb screws to secure the D-SUB DC power cord connector to the PSU.

Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return and Replacements](#) page for further information.

I/O module

Overview of add and replace I/O module - AFF C30 and AFF C60

You can replace a failed I/O module in your storage system with the same type of I/O module, or with a different type of I/O module. You can also add an I/O module to a storage system with available slots.

- [Add an I/O module](#)

Adding additional I/O modules can improve redundancy, helping to ensure that the storage system remains operational even if one I/O module fails.

- [Replace an I/O module](#)

Replacing a failing I/O module can restore the storage system to its optimal operating state.

Add I/O module - AFF C30 and AFF C60

You can add an I/O module to your AFF C30 and AFF C60 storage systems when there are slots available or when all slots are fully populated.

Step 1: Shut down the impaired controller module

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

Before you begin

If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message
command: `system node autosupport invoke -node * -type all -message MAINT=number_of_hours_downh`

The following AutoSupport command suppresses automatic case creation for two hours: `cluster1:*> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`
3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
System prompt or password prompt (enter system password)	Halt or take over the impaired controller from the healthy controller: <code>storage failover takeover -ofnode <i>impaired_node_name</i></code> When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <code>y</code> .

Step 2: Add the new I/O module

If the storage system has available slots, install the new I/O module into one of the available slots. If all slots are occupied, remove an existing I/O module to make space and then install the new one.

Before you begin

- Check the [NetApp Hardware Universe](#) to make sure that the new I/O module is compatible with your storage system and version of ONTAP you're running.
- If multiple slots are available, check the slot priorities in [NetApp Hardware Universe](#) and use the best one available for your I/O module.
- All other components in the storage system must be functioning properly; if not, you must contact [NetApp Support](#) before continuing with this procedure.

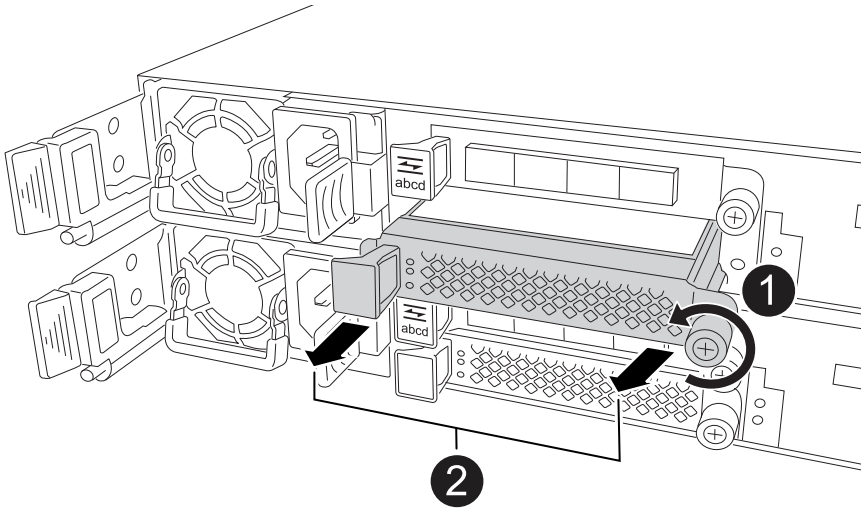
Add I/O module to an available slot

You can add a new I/O module into a storage system with available slots.

Steps

1. If you are not already grounded, properly ground yourself.
2. On the impaired controller, remove the I/O blanking module from the target slot.

Unused I/O slots should have blanking module installed to prevent possible thermal issues.



1	On the I/O blanking module, turn the thumbscrew counterclockwise to loosen.
2	Pull the I/O blanking module out of the controller using the tab on the left and the thumbscrew.

3. Install the new I/O module:
 - a. Align the I/O module with the edges of the controller slot opening.
 - b. Gently push the I/O module all the way into the slot, making sure to properly seat the module into the connector.

You can use the tab on the left and the thumbscrew to push in the I/O module.

- c. Turn the thumbscrew clockwise to tighten.

4. Cable the I/O module to the designated devices.

If you installed a storage I/O module, install and cable your NS224 shelves, as described in [Hot-add workflow](#).

5. Reboot the impaired controller from the LOADER prompt: `bye`

Rebooting the impaired controller also reinitializes the I/O modules and other components.

6. Give back the impaired controller from the partner controller: `storage failover giveback -ofnode impaired_node_name`

7. Repeat these steps to add an I/O module to the other controller.
8. Restore automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback true`
9. If AutoSupport is enabled, restore (unsuppress) automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`

Add I/O module to a fully-populated system

You can add an I/O module to a fully-populated system by removing an existing I/O module and installing a new one in its place.

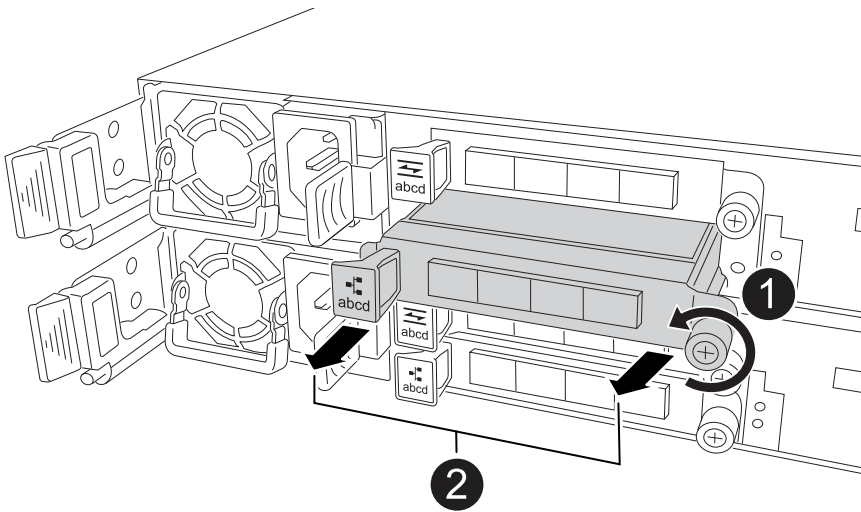
About this task

Make sure you understand the following scenarios for adding a new I/O module to a fully-populated system:

Scenario	Action required
NIC to NIC (same number of ports)	The LIFs will automatically migrate when its controller module is shut down.
NIC to NIC (different number of ports)	Permanently reassign the selected LIFs to a different home port. See Migrating a LIF for more information.
NIC to storage I/O module	Use System Manager to permanently migrate the LIFs to different home ports, as described in Migrating a LIF .

Steps

1. If you are not already grounded, properly ground yourself.
2. On the impaired controller, unplug any cabling on the target I/O module.
3. Remove the target I/O module from the controller:



1	Turn the I/O module thumbscrew counterclockwise to loosen.
----------	--

2

Pull the I/O module out of the controller using the port label tab on the left and the thumbscrew.

4. Install the new I/O module into the target slot:
 - a. Align the I/O module with the edges of the slot.
 - b. Gently push the I/O module all the way into the slot, making sure to properly seat the module into the connector.

You can use the tab on the left and the thumbscrew to push in the I/O Module.

- c. Turn the thumbscrew clockwise to tighten.

5. Cable the I/O module to the designated devices.

If you installed a storage I/O module, install and cable your NS224 shelves, as described in [Hot-add workflow](#).

6. Repeat the I/O module remove and install steps to add any additional I/O modules in the controller.
7. Reboot the impaired controller from the LOADER prompt: `bye`

Rebooting the impaired controller also reinitializes the I/O modules and other components.

8. Give back the impaired controller from the partner controller: `storage failover giveback -ofnode impaired_node_name`
9. Restore automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback true`
10. If AutoSupport is enabled, restore (unsuppress) automatic case creation: `system node autosupport invoke -node * -type all -message MAINT=END`
11. If you installed a NIC module, specify the usage mode for each port as *network*: `storage port modify -node *<node name> -port *<port name> -mode network`
12. Repeat these steps for the other controller.

Replace I/O module - AFF C30 and AFF C60

Use this procedure to replace a failed I/O module.

Before you begin

All other components in the storage system must be functioning properly; if not, you must contact [NetApp Support](#) before continuing with this procedure.

About this task

- If needed, you can turn on the storage system location (blue) LEDs to aid in physically locating the affected storage system. Log into the BMC using SSH and enter the `system location-led on` command.

A storage system has three location LEDs: one on the operator display panel and one on each controller. Location LEDs remain illuminated for 30 minutes.

You can turn them off by entering the `system location-led off` command. If you are unsure if the

LEDs are on or off, you can check their state by entering the `system location-led show` command.

Step 1: Shut down the impaired controller

Shut down or take over the impaired controller.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, [quorum status](#) of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows `false` for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter `y`.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <code>y</code> when prompted.
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode impaired_node_name</code> When the impaired controller shows <code>Waiting for giveback...</code> , press Ctrl-C, and then respond <code>y</code> .

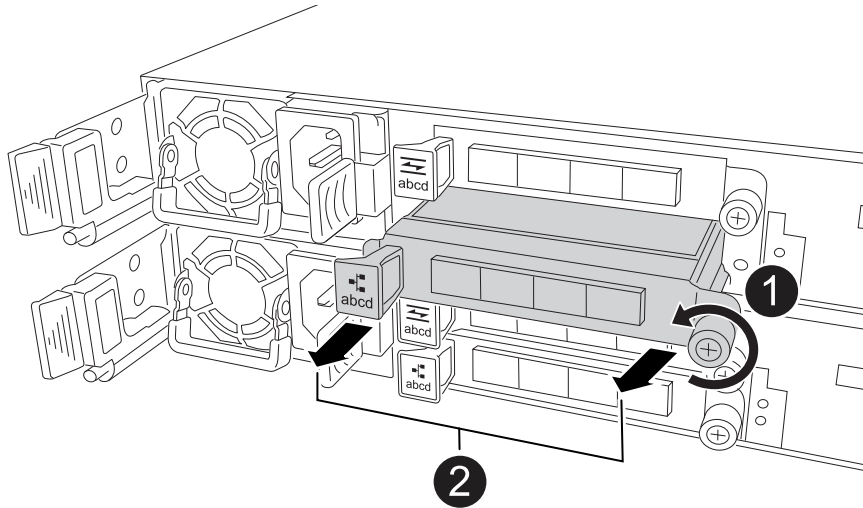
Step 2: Replace a failed I/O module

To replace a failed I/O module, locate it in the controller and follow the specific sequence of steps.

1. If you are not already grounded, properly ground yourself.
2. Unplug cabling from the failed I/O module.

Make sure to label the cables so that you know where they came from.

3. Remove the failed I/O module from the controller:



1	Turn the I/O module thumbscrew counterclockwise to loosen.
2	Pull the I/O module out of the controller using the port label tab on the left and the thumbscrew.

4. Install the replacement I/O module into the target slot:
 - a. Align the I/O module with the edges of the slot.
 - b. Gently push the I/O module all the way into the slot, making sure to properly seat the module into the connector.

You can use the tab on the left and the thumbscrew to push in the I/O Module.

- c. Turn the thumbscrew clockwise to tighten.

5. Cable the I/O module.

Step 3: Reboot the controller

After you replace an I/O module, you must reboot the controller.

Steps

1. Reboot the controller from the LOADER prompt: `b>y`

Rebooting the impaired controller also reinitializes the I/O modules and other components.

2. Return the node to normal operation: `storage failover giveback -ofnode impaired_node_name`
3. Restore automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback true`

Step 4: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return and Replacements](#) page for further information.

Replace the NV battery - AFF C30 and AFF C60

To replace the NV battery, you must remove the controller, remove the faulty battery, install the replacement battery, and then reinstall the controller.

Before you begin

All other components in the storage system must be functioning properly; if not, you must contact [NetApp Support](#) before continuing with this procedure.

About this task

If needed, you can turn on the storage system location (blue) LEDs to aid in physically locating the affected storage system. Log into the BMC using SSH and enter the `system location-led on` command.

A storage system has three location LEDs: one on the operator display panel and one on each controller. Location LEDs remain illuminated for 30 minutes.

You can turn them off by entering the `system location-led off` command. If you are unsure if the LEDs are on or off, you can check their state by entering the `system location-led show` command.

Step 1: Shut down the impaired controller

Shut down or take over the impaired controller.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced mode`) displays the node name, [quorum status](#) of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode impaired_node_name</code> When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i> .

Step 2: Remove the controller

You must remove the controller from the chassis when you replace the controller or replace a component inside the controller.

Before you begin

All other components in the storage system must be functioning properly; if not, you must contact [NetApp Support](#) before continuing with this procedure.

Steps

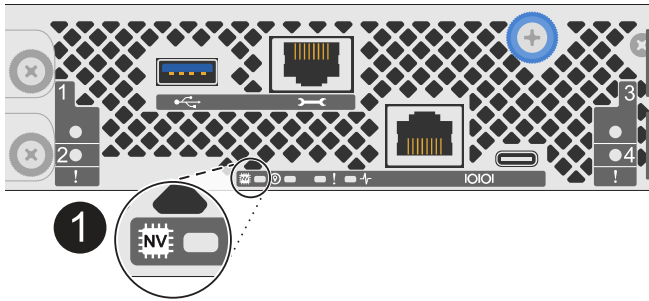
1. On the impaired controller, make sure the NV LED is off.

When the NV LED is off, destaging is complete and it is safe to remove the impaired controller.




If the NV LED is flashing (green), destage is in progress. You must wait for the NV LED to turn off. However, if the flashing continues for longer than five minutes, contact [NetApp Support](#) before continuing with this procedure.

The NV LED is located next to the NV icon on the controller.



1	NV icon and LED on the controller
----------	-----------------------------------

2. If you are not already grounded, properly ground yourself.
3. Disconnect the power on the impaired controller:

 Power supplies (PSUs) do not have a power switch.

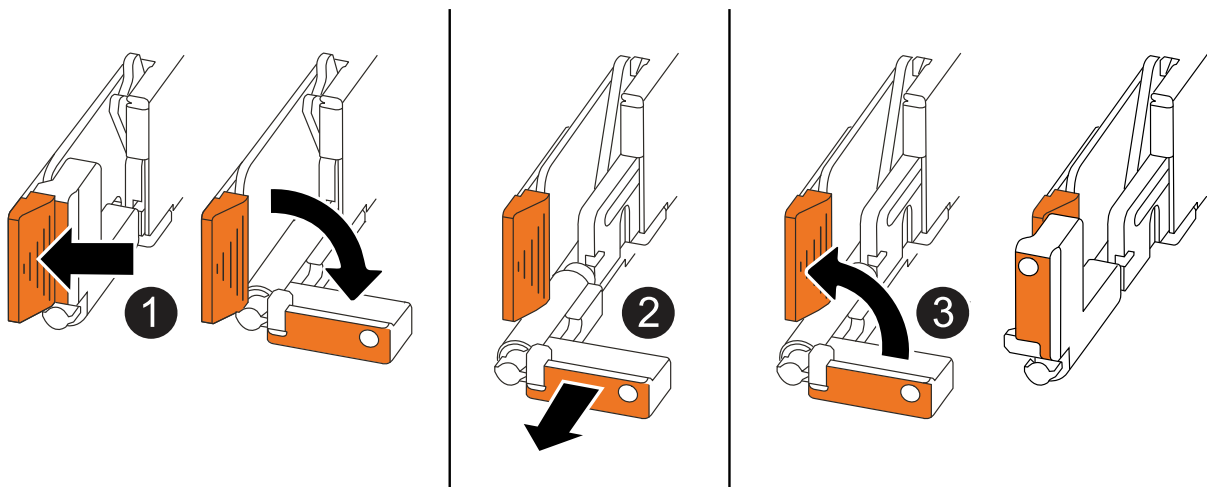
If you are disconnecting a...	Then...
AC PSU	<ol style="list-style-type: none"> 1. Open the power cord retainer. 2. Unplug the power cord from the PSU and set it aside.
DC PSU	<ol style="list-style-type: none"> 1. Unscrew the two thumb screws on the D-SUB DC power cord connector. 2. Unplug the power cord from the PSU and set it aside.

4. Unplug all cables from the impaired controller.

Keep track of where the cables were connected.

5. Remove the impaired controller:

The following illustration shows the operation of the controller handles (from the left side of the controller) when removing a controller:



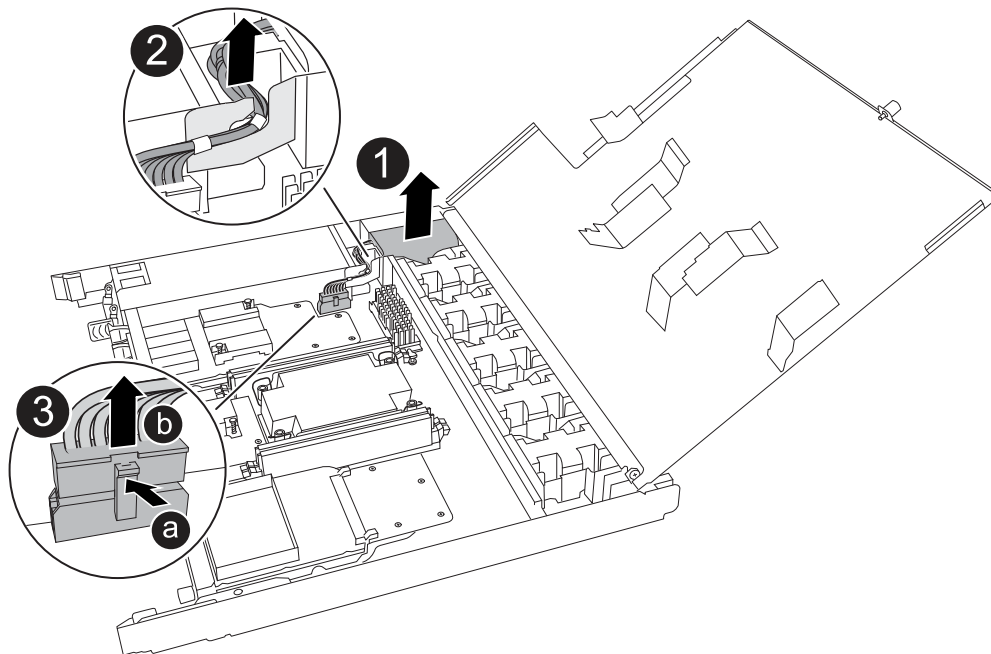
<p>1</p>	<p>On both ends of the controller, push the vertical locking tabs outward to release the handles.</p>
<p>2</p>	<ul style="list-style-type: none"> • Pull the handles towards you to unseat the controller from the midplane. <p>As you pull, the handles extend out from the controller and then you feel some resistance, keep pulling.</p> <ul style="list-style-type: none"> • Slide the controller out of the chassis while supporting the bottom of the controller, and place it on a flat, stable surface.
<p>3</p>	<p>If needed, rotate the handles upright (next to the tabs) to move them out of the way.</p>

6. Open the controller cover by turning the thumbscrew counterclockwise to loosen, and then open the cover.

Step 3: Replace the NV battery

Remove the failed NV battery from the controller and install the replacement NV battery.

1. If you are not already grounded, properly ground yourself.
2. Locate the NV battery.
3. Remove the NV battery:



<p>1</p>	<p>Lift the NV battery up and out of its compartment.</p>
<p>2</p>	<p>Remove the wiring harness from its retainer.</p>

3

1. Push in and hold the tab on the connector.
2. Pull the connector up and out of the socket.

As you pull up, gently rock the connector from end to end (lengthwise) to unseat it.

4. Install the replacement NV battery:

- a. Remove the replacement battery from its package.
- b. Plug the wiring connector into its socket.
- c. Route the wiring along the side of the power supply, into its retainer, and then through the channel in front of the NV battery compartment.
- d. Place the NV battery into its compartment.

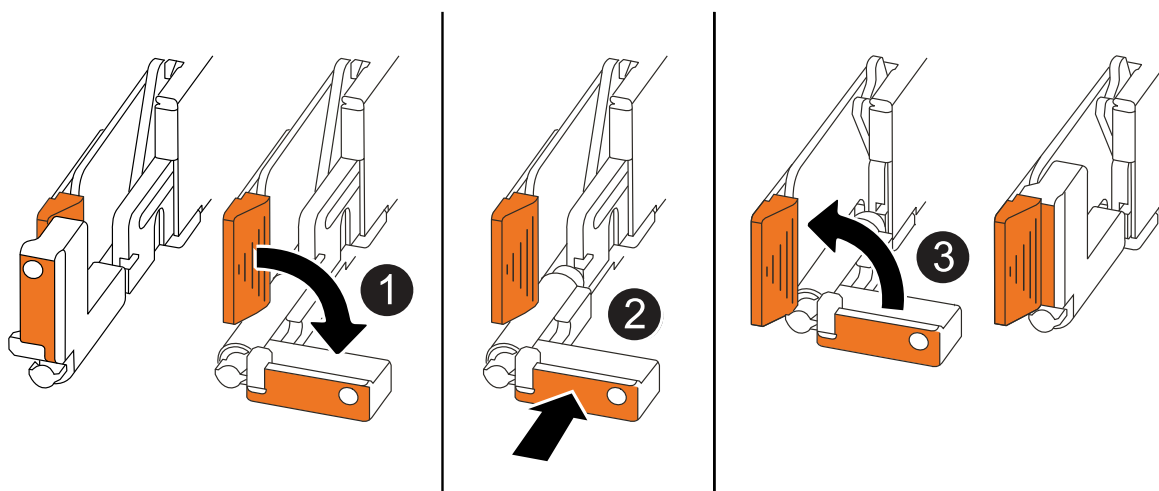
The NV battery should sit flush in its compartment.

Step 4: Reinstall the controller

Reinstall the controller into the chassis and reboot it.

About this task

The following illustration shows the operation of the controller handles (from the left side of a controller) when reinstalling the controller, and can be used as a reference for the rest of the controller reinstallation steps.



1	If you rotated the controller handles upright (next to the tabs) to move them out of the way while you serviced the controller, rotate them down to the horizontal position.
2	Push the handles to reinsert the controller into the chassis halfway and then, when instructed, push until the controller is fully seated.
3	Rotate the handles to the upright position and lock in place with the locking tabs.

Steps

1. Close the controller cover and turn the thumbscrew clockwise until tightened.
2. Insert the controller halfway into the chassis.

Align the rear of the controller with the opening in the chassis, and then gently push the controller using the handles.



Do not completely insert the controller in the chassis until instructed to do so.

3. Connect the console cable to the console port on the controller and to the laptop so that the laptop receives console messages when the controller reboots.
4. Fully seat the controller in the chassis:
 - a. Firmly push on the handles until the controller meets the midplane and is fully seated.



Do not use excessive force when sliding the controller into the chassis; it could damage the connectors.

- b. Rotate the controller handles up and lock in place with the tabs.



The controller begins to boot as soon as it is fully seated in the chassis.

5. Take the controller to the LOADER prompt by pressing CTRL-C to abort AUTOBOOT.
6. Set the time and date on the controller:

Make sure you are at the controller's LOADER prompt.

- a. Display the date and time on the controller:

```
show date
```



Time and date default is in GMT. You have the option to display in local time and in 24hr mode.

- b. Set the current time in GMT:

```
set time hh:mm:ss
```

You can get the current GMT from the healthy node:

```
date -u
```

- c. Set the current date in GMT:

```
set date mm/dd/yyyy
```

You can get the current GMT from the healthy node:

```
date -u
```

7. Recable the controller as needed.
8. Reconnect the power cord to the power supply (PSU).

Once power is restored to the PSU, the status LED should be green.

If you are reconnecting a...	Then...
AC PSU	<ol style="list-style-type: none">1. Plug the power cord into the PSU.2. Secure the power cord with the power cord retainer.
DC PSU	<ol style="list-style-type: none">1. Plug the D-SUB DC power cord connector into the PSU.2. Tighten the two thumb screws to secure the D-SUB DC power cord connector to the PSU.

Step 5: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return and Replacements](#) page for further information.

Replace a power supply - AFF C30 and AFF C60

Replacing a power supply (PSU) involves disconnecting the faulty PSU from the power source, unplugging the power cord, removing the faulty PSU and installing the replacement PSU, and then reconnecting it to the power source.

About this task

- This procedure is written for replacing one PSU at a time.

The PSUs are redundant and hot-swappable.

- **IMPORTANT:** Do not mix PSUs with different efficiency ratings or different input types. Always replace like for like.
- Use the appropriate procedure for your type of PSU: AC or DC.
- If needed, you can turn on the storage system location (blue) LEDs to aid in physically locating the affected storage system. Log into the BMC using SSH and enter the `system location-led on` command.

A storage system has three location LEDs: one on the operator display panel and one on each controller. Location LEDs remain illuminated for 30 minutes.

You can turn them off by entering the `system location-led off` command. If you are unsure if the LEDs are on or off, you can check their state by entering the `system location-led show` command.

Option 1: Replace an AC PSU

To replace an AC PSU, complete the following steps.

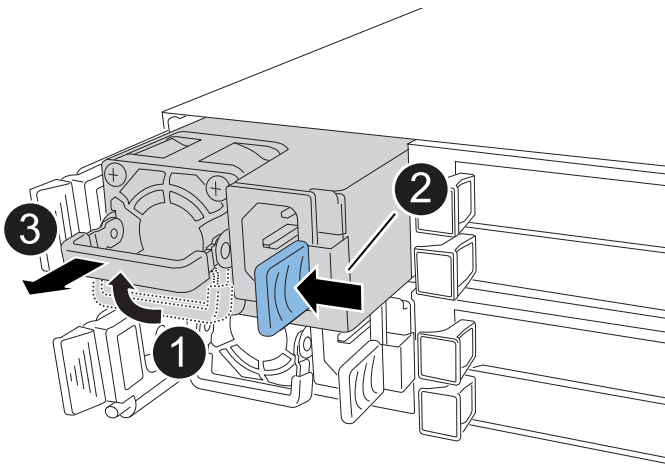
Steps


1. If you are not already grounded, properly ground yourself.
2. Identify the faulty PSU based on console error messages or through the red Attention LED on the PSU.
3. Disconnect the power cord from the PSU by opening the power cord retainer, and then unplug the power cord from the PSU.



PSUs do not have a power switch.

4. Remove the PSU:



1	Rotate the PSU handle up, to its horizontal position, and then grasp it.
2	With your thumb, press the blue tab to release the PSU from the controller.
3	<p>Pull the PSU out of the controller while using your other hand to support its weight.</p> <p> The PSU is short. Always use two hands to support it when removing it from the controller so that it does not suddenly swing free from the controller and injure you.</p>

5. Install the replacement PSU:
 - a. Using both hands, support and align the edges of the PSU with the opening in the controller.
 - b. Gently push the PSU into the controller until the locking tab clicks into place.

A PSU will only properly engage with the internal connector and lock in place one way.



To avoid damaging the internal connector, do not use excessive force when sliding the PSU into the controller.

- c. Rotate the handle down, so it is out of the way of normal operations.
6. Reconnect the power cord to the PSU and secure the power cord with the power cord retainer.

Once power is restored to the PSU, the status LED should be green.

7. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return and Replacements](#) page for further information.

Option 2: Replace a DC PSU

To replace a DC PSU, complete the following steps.

Steps

1. If you are not already grounded, properly ground yourself.
2. Identify the faulty PSU based on console error messages or through the red Attention LED on the PSU.
3. Disconnect the PSU:



PSUs do not have a power switch.

- a. Unscrew the two thumb screws on the D-SUB DC power cord connector.

The illustration and table in step 4 shows the two thumb screws (item #1) and the D-SUB DC power cord connector (item #2).

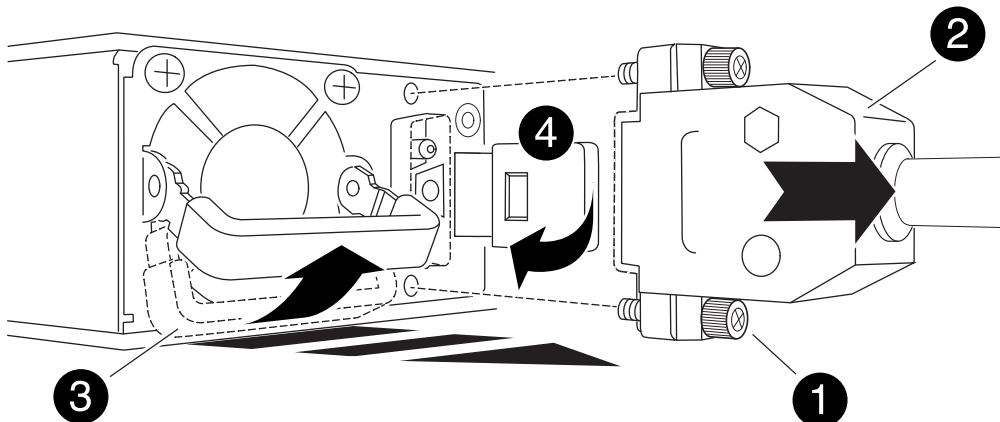
- b. Unplug the cord from the PSU and set it aside.

4. Remove the PSU:

- a. Rotate the handle up, to its horizontal position, and then grasp it.
- b. With your thumb, press the terracotta tab to release the locking mechanism.
- c. Pull the PSU out of the controller while using your other hand to support its weight.



The PSU is short. Always use two hands to support it when removing it from the controller so that it does not swing free from the controller and injure you.



1	Thumb screws
2	D-SUB DC power PSU cord connector
3	Power supply handle
4	Terracotta PSU locking tab

5. Insert the replacement PSU:

- a. Using both hands, support and align the edges of the PSU with the opening in the controller.
- b. Gently slide the PSU into the controller until the locking tab clicks into place.

A PSU must properly engage with the internal connector and locking mechanism. Repeat this step if you feel the PSU is not properly seated.



To avoid damaging the internal connector, do not use excessive force when sliding the PSU into the controller.

- c. Rotate the handle down, so it is out of the way of normal operations.

6. Reconnect the D-SUB DC power cord:

Once power is restored to the PSU, the status LED should be green.

- a. Plug the D-SUB DC power cord connector into the PSU.
- b. Tighten the two thumb screws to secure the D-SUB DC power cord connector to the PSU.

7. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return and Replacements](#) page for further information.

Replace the real-time clock battery - AFF C30 and AFF C60

You replace the real-time clock (RTC) battery in the controller so that your storage system's services and applications that depend on accurate time synchronization continue to function.

Before you begin

All other components in the storage system must be functioning properly; if not, you must contact [NetApp Support](#) before continuing with this procedure.

About this task

- You can use this procedure with all versions of ONTAP supported by your storage system.
- If needed, you can turn on the storage system location (blue) LEDs to aid in physically locating the affected storage system. Log into the BMC using SSH and enter the `system location-led on` command.

A storage system has three location LEDs: one on the operator display panel and one on each controller. Location LEDs remain illuminated for 30 minutes.

You can turn them off by entering the `system location-led off` command. If you are unsure if the LEDs are on or off, you can check their state by entering the `system location-led show` command.

Step 1: Shut down the impaired controller

Shut down or take over the impaired controller.

To shut down the impaired controller, you must determine the status of the controller and, if necessary, take over the controller so that the healthy controller continues to serve data from the impaired controller storage.

About this task

- If you have a SAN system, you must have checked event messages (`cluster kernel-service show`) for the impaired controller SCSI blade. The `cluster kernel-service show` command (from `priv advanced` mode) displays the node name, [quorum status](#) of that node, availability status of that node, and operational status of that node.

Each SCSI-blade process should be in quorum with the other nodes in the cluster. Any issues must be resolved before you proceed with the replacement.

- If you have a cluster with more than two nodes, it must be in quorum. If the cluster is not in quorum or a healthy controller shows false for eligibility and health, you must correct the issue before shutting down the impaired controller; see [Synchronize a node with the cluster](#).

Steps

1. If AutoSupport is enabled, suppress automatic case creation by invoking an AutoSupport message:
`system node autosupport invoke -node * -type all -message MAINT=<# of hours>h`

The following AutoSupport message suppresses automatic case creation for two hours: `cluster1:> system node autosupport invoke -node * -type all -message MAINT=2h`

2. Disable automatic giveback from the console of the healthy controller: `storage failover modify -node local -auto-giveback false`



When you see *Do you want to disable auto-giveback?*, enter *y*.

3. Take the impaired controller to the LOADER prompt:

If the impaired controller is displaying...	Then...
The LOADER prompt	Go to the next step.
Waiting for giveback...	Press Ctrl-C, and then respond <i>y</i> when prompted.
System prompt or password prompt	Take over or halt the impaired controller from the healthy controller: <code>storage failover takeover -ofnode impaired_node_name</code> When the impaired controller shows Waiting for giveback..., press Ctrl-C, and then respond <i>y</i> .

Step 2: Remove the controller

You must remove the controller from the chassis when you replace the controller or replace a component inside the controller.

Before you begin

All other components in the storage system must be functioning properly; if not, you must contact [NetApp Support](#) before continuing with this procedure.

Steps

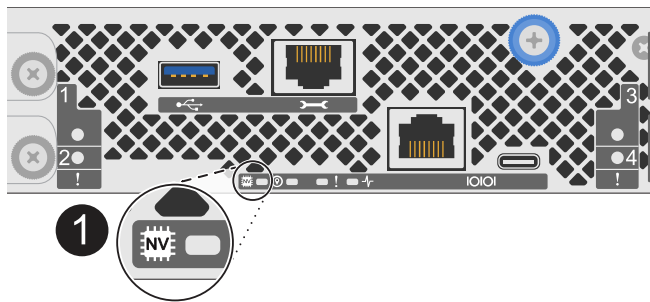
1. On the impaired controller, make sure the NV LED is off.

When the NV LED is off, destaging is complete and it is safe to remove the impaired controller.



If the NV LED is flashing (green), destage is in progress. You must wait for the NV LED to turn off. However, if the flashing continues for longer than five minutes, contact [NetApp Support](#) before continuing with this procedure.

The NV LED is located next to the NV icon on the controller.



1	NV icon and LED on the controller
----------	-----------------------------------

2. If you are not already grounded, properly ground yourself.
3. Disconnect the power on the impaired controller:



Power supplies (PSUs) do not have a power switch.

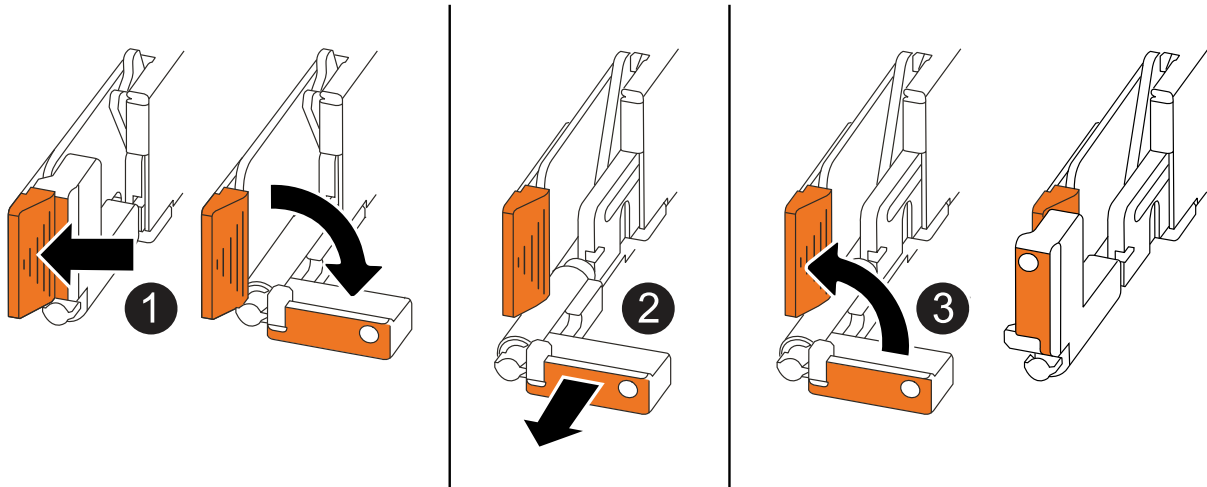
If you are disconnecting a...	Then...
AC PSU	<ol style="list-style-type: none">1. Open the power cord retainer.2. Unplug the power cord from the PSU and set it aside.
DC PSU	<ol style="list-style-type: none">1. Unscrew the two thumb screws on the D-SUB DC power cord connector.2. Unplug the power cord from the PSU and set it aside.

4. Unplug all cables from the impaired controller.

Keep track of where the cables were connected.

5. Remove the impaired controller:

The following illustration shows the operation of the controller handles (from the left side of the controller) when removing a controller:



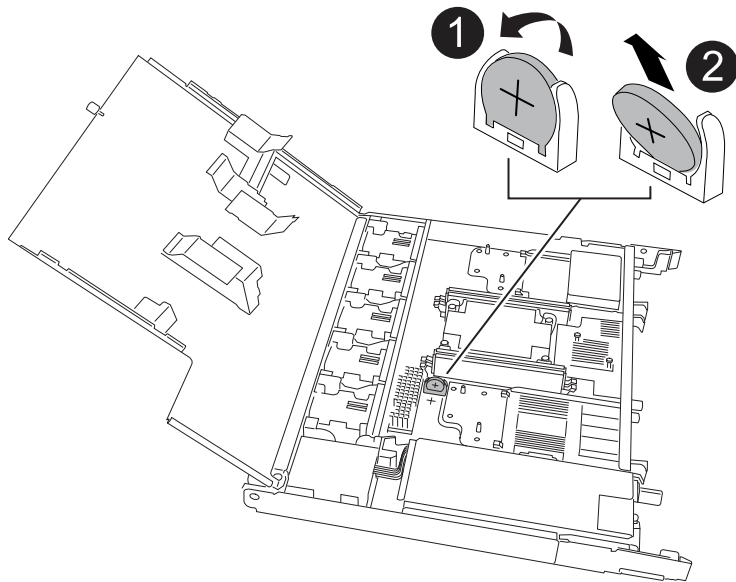
1	On both ends of the controller, push the vertical locking tabs outward to release the handles.
2	<ul style="list-style-type: none">• Pull the handles towards you to unseat the controller from the midplane. <p>As you pull, the handles extend out from the controller and then you feel some resistance, keep pulling.</p> <ul style="list-style-type: none">• Slide the controller out of the chassis while supporting the bottom of the controller, and place it on a flat, stable surface.
3	If needed, rotate the handles upright (next to the tabs) to move them out of the way.

6. Open the controller cover by turning the thumbscrew counterclockwise to loosen, and then open the cover.

Step 3: Replace the RTC battery

Remove the failed RTC battery and install the replacement RTC battery.

1. Locate the RTC battery.
2. Remove the RTC battery:



1	Gently rotate the RTC battery at an angle away from its holder.
2	Lift the RTC battery out of its holder.

3. Install the replacement RTC battery:

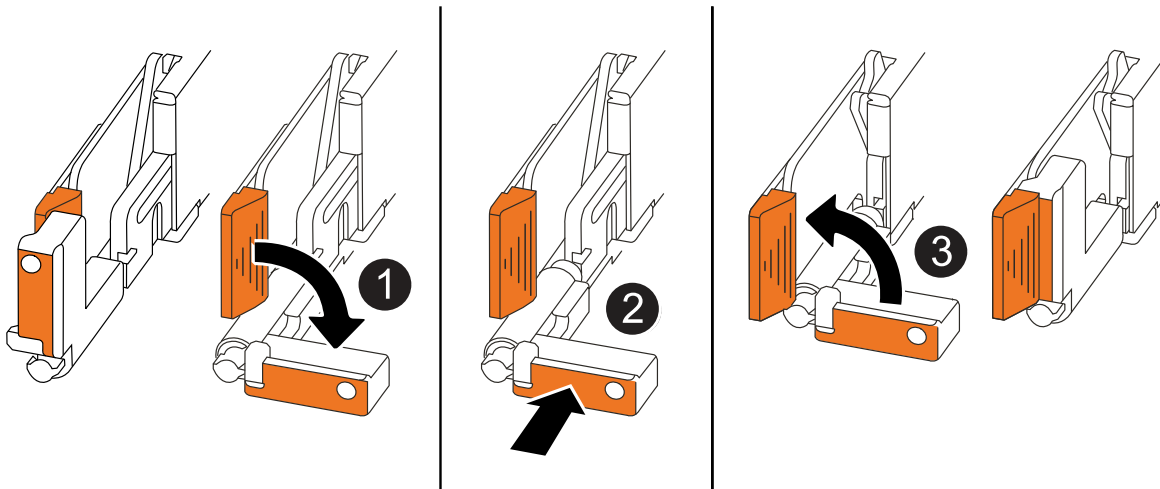
- a. Remove the replacement battery from the antistatic shipping bag.
- b. Position the battery so that the plus sign on the battery faces out to correspond with the plus sign on the motherboard.
- c. Insert the battery into the holder at an angle, and then push it into an upright position so it is fully seated in the holder.
- d. Visually inspect the battery to make sure that it is completely seated in its holder and that the polarity is correct.

Step 4: Reinstall the controller

Reinstall the controller into the chassis and reboot it.

About this task

The following illustration shows the operation of the controller handles (from the left side of a controller) when reinstalling the controller, and can be used as a reference for the rest of the controller reinstallation steps.



1	If you rotated the controller handles upright (next to the tabs) to move them out of the way while you serviced the controller, rotate them down to the horizontal position.
2	Push the handles to reinsert the controller into the chassis halfway and then, when instructed, push until the controller is fully seated.
3	Rotate the handles to the upright position and lock in place with the locking tabs.

Steps

1. Close the controller cover and turn the thumbscrew clockwise until tightened.
2. Insert the controller halfway into the chassis.

Align the rear of the controller with the opening in the chassis, and then gently push the controller using the handles.



Do not completely insert the controller in the chassis until instructed to do so.

3. Connect the console cable to the console port on the controller and to the laptop so that the laptop receives console messages when the controller reboots.
4. Fully seat the controller in the chassis:
 - a. Firmly push on the handles until the controller meets the midplane and is fully seated.



Do not use excessive force when sliding the controller into the chassis; it could damage the connectors.

- b. Rotate the controller handles up and lock in place with the tabs.



The controller begins to boot as soon as it is fully seated in the chassis.

5. Take the controller to the LOADER prompt by pressing CTRL-C to abort AUTOBOOT.
6. Set the time and date on the controller:

Make sure you are at the controller's LOADER prompt.

- a. Display the date and time on the controller:

```
show date
```



Time and date default is in GMT. You have the option to display in local time and in 24hr mode.

- b. Set the current time in GMT:

```
set time hh:mm:ss
```

You can get the current GMT from the healthy node:

```
date -u
```

- c. Set the current date in GMT:

```
set date mm/dd/yyyy
```

You can get the current GMT from the healthy node:

```
date -u
```

7. Recable the controller as needed.
8. Reconnect the power cord to the power supply (PSU).

Once power is restored to the PSU, the status LED should be green.

If you are reconnecting a...	Then...
AC PSU	<ol style="list-style-type: none">1. Plug the power cord into the PSU.2. Secure the power cord with the power cord retainer.
DC PSU	<ol style="list-style-type: none">1. Plug the D-SUB DC power cord connector into the PSU.2. Tighten the two thumb screws to secure the D-SUB DC power cord connector to the PSU.

Step 5: Reset the time and date on the controller



After replacing the RTC battery, inserting the controller and powering on first BIOS reset, you will see the following error messages: `RTC date/time error`. Reset date/time to default `RTC power failure error`. These messages are expected and you can continue with this procedure.

1. On the healthy controller, check the date and time with the `cluster date show` command.



If your storage system stops at the boot menu, select the option for `Reboot node` and respond `y` when prompted, then boot to `LOADER` by pressing `Ctrl-C`.

2. On the impaired controller, at the `LOADER` prompt, check the time and date: `cluster date show`

- a. If necessary, modify the date: `set date mm/dd/yyyy`
 - b. If necessary, set the time, in GMT: `set time hh:mm:ss`
 - c. Confirm the date and time.
3. At the LOADER prompt, enter `bye` to reinitialize the I/O modules, other components, and let the controller reboot.
 4. Return the controller to normal operation by giving back its storage: `storage failover giveback -ofnode impaired_node_name`
 5. If automatic giveback was disabled, reenable it: `storage failover modify -node local -auto-giveback true`

Step 6: Return the failed part to NetApp

Return the failed part to NetApp, as described in the RMA instructions shipped with the kit. See the [Part Return and Replacements](#) page for further information.

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